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THE LIFE AND TIMES OF GERHARDT VAN SWIETEN.

Born 1700, at Leyden. Died 1772, at Schönbrunn.

"Simplex veri sigillum."*

By Dr. A. G. Gerster, New York.

The printed material available for the study of Van Swieten's life is principally contained in the excellent monographic article by Hecker,[1] in his great work of medical biography; in Eloy,[2] then in a series of articles by Morel, in the Gazette Hebdomadaire,[3] of the years 1853 and 1854. Dezeimeris' Dictionary, Blake's biographical Dictionary, and Hirsch's similar work offer only the scantiest data of a general nature. As to the personal life and character of our man, his remarkable relations with Maria Theresa, his friendships, loves and hatreds, his habits of work and play—in short, as to his more intimate individuality—our knowledge is very scanty. What little there is has been drawn from the funeral oration, delivered on September 7, 1772, before the University of Vienna, by the Rev. Father Ignatius Wurz, Societatis Jesu, Doctor of Theology and Professor of Eloquence (Printed by Joseph Kurboeck, Vienna, 1773, 12°). Father Wurz's effort, though rhetorical as the occasion required, has the stamp of sincerity, and the statements it contains seem to be authentic and trustworthy. At any rate, they have never been contradicted.

Research of the epistolary and other material of a documentary character, which must be extant in the Archives of the University of Vienna, in the Archives of the Austrian Ministry of Instruction, and in the hands of private men, would yield abundant and extremely interesting stuff for the study of the man, his epoch, and the intricate and secret history of the fundamental work he did in establishing the first great clinical school of medicine. Such a biographical study would be worthy of the highest literary talent.

Let us now rapidly construct the historical background which served as a setting to Van Swieten's life. At the time of his birth, Holland's position was in every way eminent. Having victoriously emerged from her eighty years' war for political and religious liberty, Protestant Netherlands acquired not only enormous wealth and prosperity through trade, but by the freedom of thought and speech her laws and customs encouraged, she became one of the acknowledged centers of intellectual progress. She was the safe refuge of the persecuted from all realms, of Protestants as well as of

* Motto of Van Swieten's baronial arms.

[1] Biographies médicales.

[2] Dictionaire Historique de la Médecine, Mons, 1778.

[3] Van Swieten, sa vie et ses écrits, pp. 213, 429, 453 and 517.

revolted Catholics. Those that prefer exile to conformity have always been distinguished by intellectual elevation and force of character, hence we may say, that herein Holland was the gainer. Her flourishing schools were teeming with life and progress. Her printing industry had assumed truly amazing proportions. Everything censured and forbidden by church and court influence appeared in print at Amsterdam. In spite of the most unremitting vigilance, this intellectual contraband found its way across guarded frontiers, and reached those who were eager to receive and enjoy the forbidden fruit. In Catholic France the revocation of the Edict of Nantes had extirpated Protestantism, and the issuing of the Papal bull "Unigenitus" having led to the wiping out of Port Royal and Jansenism, the domination of the Jesuits became unquestioned. In the hereditary crownlands of Austria, the battle of the White Mountain had sounded the deathknell of Protestant resistance. Those whom the sword and the halter had spared, the irresistible pressure of confiscation and vexatious persecution compelled to emigrate. To this period (1730) America owes its Salzburger colonists who settled in Georgia, and indirectly the accession of the Moravians of Bethlehem. The interminable revolts in Hungary, provoked mainly though not altogether by religious causes, did not end until the Peace of Szathmar, 1714, had guaranteed to the Protestants free worship and full control of their own colleges. As the summary measures, employed in the Austrian crownlands had been found inapplicable in Hungary, a system of propagandism, by fair means and by any means, principally by bribery through court favor, was instituted, a system presided over by the Society of Jesus, and known in history under the name of "counter-reformation." Public instruction came under the direct or indirect control of the Jesuits, and remained there until Pope Clemens XIV, abolished the order in 1773. It is difficult for Americans to conceive the full measure of the all-pervading power and influence of this famous order. Repression of all tendencies to freedom in politics and religion, and the inculcation of unquestioning submission to authority were their cardinal tenets, and were enforced with suavity if possible, if not, with tyrannical severity.

Naturally, under this régime, the universities were the first to suffer, and under Charles VI, the father of Maria Theresa, we find at the University of Vienna an unprecedented state of stagnation. As they were the nurseries for future ecclesiastics and for the men who aspired to public office, the faculties of theology and law were well attended by students. The philosophical and medical faculties, on the other hand, reached then their lowest level of intellectual degradation. To illustrate this, it may be mentioned that in 1723 there were matriculated only 23 students of medicine at the University of Vienna. The teaching was purely didactic, and in every way mediæval. There was no chair of anatomy until the year 1736, and the newly created chair remained unfilled until 1739—its first three incumbents being absolute nonentities. Dissections were rare, and during the year 1742[1] none whatever were held.

However, it would be unfair to omit to state that, bad as the case of the universities was at the hands of the Jesuits, their management of the middle grades of public instruction was excellent. Their methods were rational and thorough, and the results were so well appreciated, that before entering into Protestant colleges or migrating to Protestant German or Dutch universities, many Protestant students were sent by their parents to Jesuit Gymnasia.

The reason of the neglect of philosophical and medical studies is to be sought in the fact that these imply free inquiry, the questioning of authority, and the exercise of free judgment. These conditions are the soul of all true science, and because they are subversive to the habit of submission to dogma and authority, they were consciously discouraged.

This was the state of public—more especially of medical—instruction in Austria at the time of Maria Theresa's accession to the throne in 1740. She was then twenty-three years old, and it is well known what obstacles and dangers she had to contend with during the war of the Austrian Succession and the two Silesian wars, which filled the first years of her reign. The time of the accession of Maria Theresa and of Frederick the Great, marks the beginning of a struggle between the houses of Hapsburg and Hohenzollern, that was to last over one hundred and twenty years, and was not to end before the final defeat of Austria at Königgrätz in 1866.

The mediæval despotism of Austria was sustained by the support of a servile and grasping aristocracy, a conceited and retrograde hierarchy, and a motley army commanded by mercenary officers, drawn to a great extent from the impoverished nobility of all the nations of Europe. The cynical and shameless pursuit of dynastic interest had been the sole preoccupation of the immediate predecessors of Maria Theresa, but especially of her father, Charles VI. The fanatical repression of Protestantism, however, had its inspiration as much in dynastic self-interest as in narrow bigotry. The rise, out of the unpromising Hapsburg stock, of an imposing figure, such as we find to have been the Queen of Hungary and Bohemia, is a remarkable and interesting event. Her youth and her whole life remained unspoiled by the moral contamination that overspread Europe from the cesspool of French corruption under Louis XIV, the Orleans regency, and the Court of Louis XV. The fearful dangers through which she had to fight her way from the very beginning of her reign, only helped to call forth the fine mettle and unshakable courage of this virtuous and virile-minded woman.

Her native intelligence and force of character, goaded by the necessities of impending danger, as much as by the successful example of her main adversary, the unprejudiced and progressive young King of Prussia, soon taught the young Queen to break through the iron trammels of ossified usage and tradition, to recognize antiquated and inefficient conditions inherited from the supine administrators of preceding

[1] Neuburger and Pagel, Geschichte der Medicin, Vol. II, p. 204.

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reigns, and to reach out for the aid of modern men fit to repair the effects of long-standing neglect and incapacity.

When Maria Theresa ascended the throne, that part of the Netherlands which corresponds to present-day Belgium was still an Austrian possession. Many liens of a common history, of blood and interest, persisted between the Dutch Republic and its Catholic sister. In the latter, a respectable measure of modern progress in arts and sciences was irresistibly induced by mere propinquity to Holland. Louvain attracted Catholic students from Holland, while the Protestant subjects of Maria Theresa frequented Leyden, this exchange naturally leading to mutual assimilation of ideas, to emulation, and to salutary rivalry. Evidently the great difference between the energy manifested by the schools of the Netherlands, and the lethargy that dominated Vienna, did not escape the attention of Maria Theresa.

Gerhardt Van Swieten was born at Leyden on May 7, in the year 1700, of Catholic parents. His father, Thomas, and his mother, Elizabeth Van Loo, were of old Dutch stock, and of noble quality. The history of the Van Swietens went back to the XIV Century, they having multiform relations of blood with the best families of the Low Countries. In spite of persecution, and against their material interests, they had remained steadfast Catholics. They had furnished to their country statesmen, jurists, soldiers, and administrators of distinction and merit.

Gerhardt received his first training in the Latin school of his native town, where his alacrity and studiousness attracted attention. While at this school, he lost both parents. The care of the orphan devolved on certain guardians who, according to Father Wurz, shamefully neglected the boy's temporal and spiritual interests. The reverend Father's acerbity seems to indicate, that the boy frequenting a Protestant school, sufficient attention was not paid to church attendance, confession and communion, and also that his clothing and personal cleanliness were neglected. Whatever this may mean, his zeal and unguided energy overcame all obstacles. He graduated with honors, showing special proficiency in Greek and Latin—in those days the "*sine qua non*" of eminence in the learned professions. At sixteen, he was sent to Catholic Louvain, to prepare himself for an administrative career, to which, following family tradition, his parents had destined him. The mastering of law and of administrative science was the proper purpose of his sojourn. He not only absorbed all that was offered, but found time to cultivate modern languages, mathematics, chemistry, physics, and the natural sciences—for all of which he had developed an early and eager predilection. From the beginning, his teachers became aware of the good parts of the boy—intelligence, penetration, practical sagacity and good judgment, together with dogged industry and a prodigious memory being mentioned by them. The great diversity of his studies, notably useful notions of the law and of administration acquired at Louvain, were to him of the utmost utility in his later career as organizer and administrator. The study of a wide range of human knowledge was in the air at the time, and this passionate acquisition of manifold information led to the rise of the French encyclopædists.

Boerhaave's fame undoubtedly made the young man, an omnivorous reader, to take curious cognizance of his writings, and the great teacher's spell, thus cast over Van Swieten, was strong enough to determine a change of career. Accordingly, we see him at eighteen returned to Leyden, and sitting at the feet of the Master, whose lectures he followed from this time on for twenty consecutive years. Boerhaave was then fifty years old and at the zenith of his European fame. Immediately their relations became close and cordial, and remained unchanged until the Master's death. After seven years of medical study, Van Swieten was, in 1725, graduated Doctor of Medicine. The theme of his inaugural thesis was "De arteriæ fabrica." On this occasion Boerhaave took pains publicly to designate him as an equal, and the worthiest of his pupils to become his successor. Contemporary authors all dwell with sympathetic interest on the touching relations of friendship that subsisted between these two remarkable men. Sincere manifestations of Van Swieten's exemplary modesty crop out frequently on the pages of his life's work, "The Commentaries." This sentiment, the depth of which cannot be questioned, led to his steadfast self-effacement, to the very end, before his Master, Boerhaave. Throughout his long life the great physician, organizer, statesman, and favorite of the Empress Maria Theresa, consistently and proudly proclaimed himself a mere pupil of his teacher. All he knew, all that he accomplished was attributed to the influence of Boerhaave. In the preface to the Commentaries, we read the often quoted sentence: "It has been my good fortune to have an opportunity of attending Boerhaave's lectures, both public and private, for the space of near twenty years. What I hold to be still more fortunate, during all that period, I have had the honor of being admitted to a large share of his friendship and conversation, and have been allowed to consult him freely upon every difficulty which occurred. These advantages have been peculiar to myself."

To nothing except these relations must be attributed Van Swieten's unwillingness to write down his medical knowledge, original in many respects, in the shape of an independent work. His avowed preference was to figure as a mere commentator of his teacher. To the individualism and egotistic trend of our days, this sentiment is almost incomprehensible.

In 1729, Van Swieten married Maria Lambertine Theresa Beck Von Coesfeld, daughter of an ancient and noble family, issued from Cassel in Hessia, from whom he had two sons and two daughters. We find mention of a serious illness befalling him in the early years of his marriage. Excessive application to study, and the lack of recreation and exercise seem to have produced a profound mental and physical depression, easy to recognize as a form of grave neurasthenia. Father Wurz's funeral oration thus describes the condition: "To search for the fundamental principles of the sciences at their very sources; to renounce, for the sake of solid work, all society; to enclose one's self in solitude, unbroken even by the hours of repast; to neglect taking nourishment until forced by

necessity; to rob the nights of required rest; thus to continue until the overburdened spirits fall into a state of sombre and sad melancholy, and the exhausted body succumbs to the load; until bodily strength disappear; sleep vanish, and food and recreation become a source of disgust—to this régime, maintained for several years, led the immensity of the labors of Van Swieten," etc.

Boerhaave, who had been mildly protesting against these excesses, finally became seriously alarmed. Fortunately, earnest remonstrances, and the evident necessities of the case, did not fail to bring about a radical change of habits, and a cure of the malady. In 1736, against much Protestant opposition, overborne, however, by Boerhaave's influence, Van Swieten was appointed Professor to the Chair of Materia Medica. Immediately his lectures became very popular, especially among the English students. This very popularity, however, was the undoing of the young Professor's ambition. An old law, forbidding the occupancy by a Catholic of public office in Holland, was invoked by envious Protestant rivals, and Van Swieten had to relinquish his chair. Thus we see, that in this instance, Catholic intolerance found a worthy counterpart in Protestant meanness. As soon as the issue became public, an outraged and generous student body arose in riotous protest. The instigators of the intrigue against Van Swieten were waylaid, mobbed, and but for the energetic personal intervention of Van Swieten himself, would have sustained serious bodily damage. On this occasion, as well as ever afterward, one of the leading traits of our man's character proclaimed itself. It was a pronounced aversion to strife and controversy. In all his writings you will search in vain for even a single sentence conceived in the polemic spirit so common in those days. When conviction compelled divergence, Van Swieten always found a proper way of robbing dissent of its sting. Morel states, that the sharpest dart he ever fired into an opponent, was that used in reference to some erroneous ideas on the bile, advanced by a Dr. Simson. The term, "candidus vir," that is, a naïve, simple-minded man, or simpleton, is immediately toned down by the remainder of the phrase, which runs thus: "Ex cujus scriptis me plura et utilissima didicisse lætus recordar," *anglice*—"From whose writings I gladly acknowledge to have learned many and most useful things." May it not be inferred that the pacific attitude of Van Swieten was rooted in a lack of the sense of humor, a disposition to take things over seriously, and also in the instinct of the well-bred man, who loves above all good form and suavity? The difference between Van Swieten and his illustrious schoolmate and successor in the Chair of Medicine at Vienna, the pugnacious, witty, and aggressive De Haën is very pronounced.

Shortly after his retreat from the Chair of Materia Medica, a tempting offer was extended to Van Swieten to settle in England, where an annual fixed income of 1000 pounds, to be derived from the interest of a capital deposited *"ad hoc,"* was to secure him against care. He declined the offer, the main reason therefor, according to Father Wurz, being his disinclination to live in a country, where Catholic public worship was a crime, punishable under the laws of the realm. Thus we see him remaining very content at Leyden, at peace with himself and the world, enjoying the pleasures of a studious life spent in the friendly atmosphere of his beloved master, Boerhaave.

It would be extremely interesting to shed light upon the factors that determined the first contact of Maria Theresa with Van Swieten. In the absence of facts at our disposal, we may be permitted to bring forward a legend, that circulates to this day at the University of Vienna regarding the first service Van Swieten had rendered his mistress at the time following her nuptials to Francis of Lotharingia, in 1736. The young princess was a robust, tall, earnest, and unspoiled girl of nineteen, who, thoroughly impressed with the importance of her future position, had been spending the best of her time in the company of an array of male teachers of ripe age. In studies, the enthusiastic pupil needed restraint rather than encouragement; she was made to seek recreation in outdoor sports, especially horseback exercise, which suited her energetic and fearless disposition. Latin, according to usage, was the language of her instruction, and she acquired such a mastery of the idiom, that she could not only maintain, with much adroitness her side of a learned dispute, but could "ex tempore," deliver a lengthy address, called for by any occasion, and undismayed by a numerous audience. Her Latinity was much praised by experts. Beside the ancient authors, her studies embraced the political and administrative sciences, law, and all the accomplishments that were indispensable to a person of her high destiny. She revelled in the company of men distinguished in learning and state-craft, and combined with the ingenuousness of a young girl a remarkable precocity with much force of character. Having thus been brought up like a young man rather than a girl, she entered wedlock in absolute innocence of mind and body. The genitive instincts of the young bride of nineteen were under the glacial burden of much learning, and her aversion to the intimacies of the married state were such an obstacle to the hope of future progeny, that it became a subject of serious care and embarrassment to the court. The legend says, that acceptance of the advice of Van Swieten, delivered in solemn consultation, speedily overcame the difficulty, its application resulting in pregnancy, and the happy delivery of a princess.

The bare facts, as known to us, say that the first volume of the Commentaries had appeared in 1741; in 1745 it was followed by the second; and immediately after this the Queen extended to him a flattering call to move to Vienna and to become her "Leibarzt." As motives that may have prompted her action, we may mention: First, the shameful state of all medical affairs in the realm, an absence of talent and capacity, compelling her to go abroad for a competent physician in ordinary; then, the urgent desire, prompted by her keen sense of a sovereign's duty, to remedy the scandal. As to the choice of the man, we may say that he was then the foremost pupil of the famous Boerhaave, was a man of well-known talent, of good breeding and unquestioned integrity; and last, but perhaps not least, that he had borne persecution for their com-

mon Catholic faith and, though tempted with gold, had, on account of conscientious scruples, declined to enter heretical England. She would thus do a noble deed by exalting one worthy and persecuted, would acquire the services and gratitude of a man of unquestioned eminence and utility, and would at the same time teach the Protestant Dutch a useful lesson.

Not without hesitation, Van Swieten finally accepted the Queen's offer, and we see him arriving in Vienna on June 7, 1745. This migration marks the closure of the first epoch of his life, an epoch devoted to the acquisition of knowledge for knowledge's sake, warmed by the glow of the friendship of Boerhaave, embellished by the affections of family life and by the simple pleasures of a student's existence at a small university. He had acquired little practice, but a modest patrimony afforded him all the liberty and comfort that were necessary to a scholar's contentment. The change from the happy but bourgeois mediocrity of Leyden to the pomp and circumstance of the imperial court of Vienna, must have meant a veritable revolution to the habits of the student and recluse. The promptness with which middle-aged Van Swieten was able to adjust himself to the radical change, testifies to the elasticity and energy of his temper. Surely there could have been little in his makeup of the rigidity of the book-worm and pedant.

The first sign of the Queen's satisfaction with her protégé was his elevation to the barony. The motto selected by himself for his arms was characteristic of the man: "Simplex veri sigillum."[5] Undoubtedly, the mutual understanding so quickly established between him and the Queen was based on many points of agreement in their characters. Both were serious in the conception of their duties; both religious without an excess of formalism and bigotry; both just as resolute and fearless in facing ugly facts as they were energetic in meeting them by action. The friendship and kindness of the sovereign, famous for her simplicity and almost bourgeois directness of manner, were reciprocated by the sincere and earnest devotion of Van Swieten. He felt no hesitation in suggesting improvement where there was need for it. Plain-spoken, but as to manner always polished, he evidently possessed the rare art of awakening and maintaining the Queen's interest in whatever he laid before her, for otherwise how could the curious fact be explained, that in the midst of the tremendous cares of her great wars she found time to institute, through his agency, all the incisive reforms that actually took effect shortly after his appearance at Vienna.

The foremost of these innovations was the successful establishment on a great scale of the clinical teaching of medicine. Teaching at the bedside was unknown then both in Germany and Austria. We find its first rudiments in Padua, where, about 1558, Bottoni and Oddo are mentioned as having occasionally demonstrated patients to their students. Their example was imitated for a while at Pavia and Genoa, but in the 17th Century all trace of the movement had disappeared except at Leyden, where, between 1602 and 1632, at the Collegium Practicum, bedside demonstrations were given in a desultory manner. The official establishment of a public clinic at Leyden was determined by the marked falling away of the number of students, caused by the attraction of the great fame of Professor Straten, of the newly-founded University of Utrecht. To meet this dangerous competition, Leyden, under the direction of Otto Heurnius, organized a public clinic with twelve beds, to which students were to be admitted twice weekly. Autopsies were to supplement clinical teaching. At first the students did not take kindly to the innovation, preferring the conventional didactic lecture *ex cathedra*, so that not rarely the professor had to make his rounds unaccompanied by even one student. The fate of the new way hung in the balance for a long time, but its advantages were so manifest to the successors of Heurnius, that after him Albert Kyper, and then about 1658, Francis Sylvius de Boé, then about 1715 Bildoo, courageously maintained the tradition, until Boerhaave's great personality appearing, the matter became settled forever. The battle begun by Roger Bacon against the chimæras of scholastic learning, continued by Francis Bacon, who emphasized the hollow worthlessness of preconceived theory compared with the evidence of well-observed fact—this battle was to be brought to a final issue in the modest clinic of Leyden. Here it was that Van Swieten became thoroughly saturated by Boerhaave's discipline, and the happy combination of a great principle arming the hands of a great man, with a great opportunity properly seized, resulted in the establishment of modern medical teaching.

Van Swieten, having been appointed professor to the Chair of Medicine in 1746, had, on account of the lack of a suitable lecture-room, to begin his teaching in the vestibule of the court library (Hofbibliothek). Immediate steps were taken, however, to supply what was wanting, and the adaptation of existing and the erection of new buildings were commenced. At this time he made a gift to the medical faculty of his large and valuable collection of anatomical preparations, which, according to Hyrtl, still forms the kernel of the anatomical museum of Vienna. Maria Theresa, much impressed by the energy and success of her "Leibarzt," was easily induced to notice the shortcomings of all other branches of public instruction. The result was, that the whole matter of higher instruction was entrusted to Van Swieten. In quick succession he became Director of the Army Medical Service and of the Imperial Library.

Until this time, this, one of the richest collections of books then extant was inaccessible to the public. Van Swieten not only threw open the library to everybody, but his practical sense provided a well-lighted reading-room, properly furnished with writing materials and heated in cold weather, so that visitors could comfortably follow their studies and make notes and excerpts. This innovation met with resistance, but Van Swieten's determination overcame the opposition.

In those times, except in Holland, the official censure of all printed matter was an accepted prerogative of government.

[5] Originally this was Boerhaave's own motto; it was adopted without change by Van Swieten.

This duty naturally devolved on the court librarian, Van Swieten. As he, himself, had tasted the bitter fruits of religious persecution, he exercised the functions of this office with moderation and good sense. It is difficult to determine how much his own convictions and how much pressure from above had to do with his forbidding the circulation of the works of the French encyclopædists. This repressive attitude brought down upon him the hatred and scorn of these iconoclasts, by one of whom, Voltaire, he was pleasantly apostrophized as "a tyrant of the mind, and (in his capacity of physician) an assassin of the body."

All other branches of university teaching beside medicine were vivified by his influence, the philosophical faculty receiving its share of attention. New chairs were established in mathematics, astronomy, physics, chemistry, and the several branches of natural history—even philology not escaping his interest. He, himself, began the study of Hungarian and Arabic.

The multiplicity of his onerous duties finally compelled him to cease teaching, but he provided a worthy successor in the person of the fiery De Haën, who was installed in 1756, Gasser was called to the chair of anatomy, Stoerck to that of pharmacology, and young talented men, sought out sedulously by himself, were dispatched abroad to absorb new knowledge, later to be utilized in teaching.[6]

In the selection of suitable personalities for the multiplicity of posts to be filled, Van Swieten showed remarkable tact and talent. In the Austria of those days, more even than to-day, court favor had everything to do with the filling of appointments. Van Swieten's good sense, integrity and firmness of character, backed by the unswerving trust of the Queen, knew how to meet undue influence exercised on behalf of pushing mediocrity. No blandishment or threat of aristocratic or clerical backers of unworthy candidates could ever make him deviate from a selection made after due deliberation. His kindness to talented young men issuing from the humbler walks of life, was proverbial, and was practically attested by the foundation of many scholarships. The care of the widows and orphans of medical men also engaged his solicitude, and led to the organization in Vienna of one of the greatest societies devoted to this purpose.

In 1763, the new university building was inaugurated. At the order of their Imperial Majesties (Francis and Maria Theresa having attained their new dignities), the oil portrait of Van Swieten was apposed to a conspicuous wall of the aula, with the following inscription:

Franciscus I, et Maria Theresia Augg.
Hanc effigiem
Gerardi L. B. Van Swieten,
Ob Studium medicum ab ipso feliciter emendatum
In auditorio hujus facultatis publice appendere jusserunt
Die XXX. Decembris, MDCCLXIII.

[6] To those who wish to study the effects of the first Vienna school upon the development of medicine, the work of H. Lebert, "Ueber den Einfluss der Wiener Schule des 18ten Jahrhunderts auf den positiven Fortschritt in der Medicin, Berlin, 1865, can be warmly recommended.

In another direction, Van Swieten's personal influence brought about great amelioration. Convinced that, to do their best, men of science must enjoy a certain material ease and a reasonable independence from sordid cares, he induced the Empress considerably to augment the perquisites and salaries of the University teachers.

Though multiform and onerous duties, scrupulously and diligently fulfilled, much retarded, they did not interrupt his literary activity—notably, the finishing of the Commentaries, the fifth and last volume of which did not appear until 1772, that is, shortly before his death. Besides this, he found opportunity to write an excellent manual on the diseases and injuries affecting the army,[7] then a Latin work on the London epidemics, and a number of other treatises of less extent.

To illustrate the scientific significance of Van Swieten, we cannot wish for a better document than his famous Commentaries. In them he adopted Ramsay's method. Each one of Boerhaave's aphorisms serves as the text for a monograph, embracing all that in those days was known of the subject.

His temperamental soberness and reserve made him a peculiarly fit exponent of the transitional era in which he lived. The respect for authority, especially for the ancients as transmitted by clerical scholasticism, is still apparent in his text; but facts as facts are not distorted to fit the rigid frame of preconceived theory. The readiness of the scholastics to furnish a cut-and-dried explanation for every conceivable fact, and their alacrity to ascend through pure dialectics to the primary cause of everything, are absent from Van Swieten's manner. His unbiased and sensible attitude of mind is well illustrated by the following anecdote. He once said:

People are amused by the words of Molière's candidate of medicine, who declares that opium produces sleep because its virtue is soporific; yet he said all that could at the present be said on the matter.

His love of truth as he understood it, his freedom from controversial bias and preconception, are refreshing to observe at a time, when the bad manners and vicious acrimony of religious polemics had found their way into medical literature. Of this Von Haller and De Haën offered most reprehensible examples. Van Swieten's inclination to begin each inquiry by observation, and to argue and theorize therefrom, becomes more and more manifest as we progress from the first to the last volume of the work. Whenever the premises are insufficient, he honestly admits the fact, and declines to draw conclusions. To this attitude of mind is to be attributed Van Swieten's critical sifting and simplification of the prevailing and grotesque pharmaceutical notions of his time. He inspired the first attempts at physiological experiment made by Stoerck, who studied the effects of certain poisonous plants, as, for instance, aconite and hemlock on the living body.

Boerhaave's hostility to inoculation was reflected in Van Swieten by the milder attitude of simple evasion; but when

[7] There is strong reason to assume that his authorship of this opuscle is apocryphal: *Willibald Müller:* Gerhard van Swieten, Vienna, 1883.

Maria Theresa, herself, contracted the small pox in 1767, the good sense of the Empress over-rode her physician's lack of faith. She ordered all her household inoculated, though not without first gaining Van Swieten's formal assent.

Up to Van Swieten's time the treatment of syphilis had remained in a barbarous state, excessive salivation being considered indispensable. Observing the fact, that in many instances the malady had the tendency to run a self-limiting course, he concluded that the immoderate use of mercury was unnecessary and harmful. Precursor of this view was the "cura per extinctionem," that is, the "expectant" method that had originated at the school of Montpellier. In 1754 he succeeded in securing for Maximilian Locher the appointment of Director of St. Mark's Hospital, in which all cases of syphilis were then collected. Under his direction, Locher began the methodical use of small doses of the watery solution of corrosive sublimate, first in the strength of one-quarter of a grain to the pint of water. To test the tolerance of the patient, this was gradually increased. Results were very encouraging, many cures succeeding without any salivation whatever. At this time it happened that a Portuguese student named Ribeiro Sanchez, having recently returned from St. Petersburg, told Van Swieten of the employment of the same drug by an old Russian surgeon, who dissolved one grain in two ounces of brandy, administering the solution in teaspoonful doses. Immediately the matter was put to the test, and having been found reliable, the new preparation was admitted to the pharmacopœa under the name of "liquor Swietenii."

As to the literary character of the Commentaries, we may first note the concise, yet lucid Latinity of its text, to which, in a great measure, must be attributed the long popularity of the work. The author's immense erudition is attested by over five hundred references to ancient and modern authors.

Six years after the arrival of Van Swieten at Vienna, that is, in 1751, a young man by the name of Leopold Auenbrugger was appointed to the vacant position of physician to the Spanish (military) Hospital. Ten years later, Auenbrugger published his "Inventum novum," the result of seven years' research, containing the first exposition of what we now call physical diagnosis by percussion. As Auenbrugger was the immediate pupil of Van Swieten at Vienna, and repeatedly refers to his master in the text of the "Inventum," it is not conceivable that the fact of the discovery of this new and valuable aid to diagnosis should have remained unknown to Van Swieten. The fact is, however, that no mention is made of Auenbrugger's epoch-making discovery in the last two volumes of the Commentaries, published in 1764 and 1772 respectively, though they contain two long treatises on pulmonary phthisis and on pleuritic effusions. De Haën, Van Swieten's successor in the Chair of Medicine, paid no more attention to the work of Auenbrugger than did his predecessor. Though mention was made of the new invention in two or three of the scientific periodicals of the time, the great contemporary authorities failed to recognize its importance. Most of those who noticed the "Inventum" did not even grasp its meaning, confounding "percussion" with the "succussion" of Hippocrates. Abstaining from a criticism of Van Swieten's attitude in the matter, we shall let it rest after having stated the facts. Auenbrugger's invention, failing to attract the notice of the leaders in medicine of his time, fell into oblivion until 1808, when Corvisart, Napoleon's physician, recognizing its surpassing merit, translated the "Inventum" into the French language. According to the ways of human nature, this meritorious invention, like others, was accepted by the countrymen of the inventor only after a foreigner of distinction had put the seal of his approval to it. Corvisart's translation was followed by Laennec's and Skoda's labors, which, in turn, made the modest Styrian's discovery the universal possession of the world.

Up to the year 1769, we see the great physician and administrator indefatigably directing the arduous work of intellectual and practical regeneration, smoothing the ways for everything that seemed to him salutary and progressive, steadfastly supported in everything by the confidence and energy of the great Empress. In that year, however, his health began to suffer from an increasing disorder of assimilation. Aging rapidly, he tired quickly, complained of coldness in the limbs and of recurrent pains in one leg, symptoms suggesting to our mind intermittent claudication. Evidently, his arteries were degenerating, for in March, 1772, a bleb appeared on one of the toes, and after the detachment of the slough, the phalanx became exposed. Knowing that his end was approaching, he hastened the publication of the final volume of the Commentaries, and had the pleasure of seeing his life's work completed. When spring had set in, the Empress arranged for his removal from the city to the salubrious airs of Schönbrunn. His declining days were cheered by her frequent and familiar visits. She called on him the last time a week before his death. This ensued from gangrene of the leg on June 18, 1772. Sustained by a steadfast faith, he bore his affliction with exemplary cheerfulness and resignation.

At his death, the grief of the Empress manifested itself in a long and passionate fit of crying. By her orders, his statue was erected in the aula of the University. His body was interred in the crypt of the Augustins, where it reposes with the ashes of illustrious soldiers and statesmen. The memorial service held in his honor at the University of Vienna was mentioned at the beginning of this paper. A similar tribute was accorded to his memory by the Paris Academy of Sciences, where, on April 21, 1773, an oration was delivered by the Secretary, M. de Fouchy. However, the most perennial monument, erected by himself to his own fame, was the firm establishment of the clinical method of teaching medicine and surgery. Vienna's example led to its rapid and universal acceptance in Germany and abroad. It also laid the foundations for the development of the second school of Vienna, the exponents of which were Rokitansky, Hyrtl, Brücke, Skoda, Oppolzer, Hebra, and Billroth.

To the traits of Van Swieten's personal character, heretofore mentioned, we may add one or two more, adduced by Father Wurz. His temperament was ardent and impetuous,

and whenever amongst his subordinates he met with inexcusable negligence, but especially with a veiled passive opposition, he was apt to be carried away by just indignation. But the very hotness of such an explosion exercised upon him a sobering effect. Unqualified condemnation was first modified into friendly remonstrance, then turned to kindly advice, usually ending in apologies proffered to the culprit for the violence of the well-merited rebuke. His native love of honesty and truthfulness was so strong, that from the moment a fault was frankly confessed without subterfuge or tergiversation, his forgiveness was assured. Deception and lying, however, were invariably followed by merciless expulsion from office.

It is needless to state, that the injection of such an energetic and aggressive character as Van Swieten's into the stagnant life of the Vienna court, stirred up many a hornet's nest, and must have been the cause of endless intrigue. His very ingenuousness and abstention from strife and underhanded plotting, won for him the unfailing confidence and support of the Empress. Their relations remained untroubled and cordial to Van Swieten's death.

A great consulting practice and the emoluments of office naturally permitted him to accumulate a modicum of wealth, a large proportion of which, however, was spent in aiding the indigence of less fortunate colleagues, their widows and orphans, both in Holland and Austria, and in furnishing means to needy but talented students, numbers of whom were regularly aided by him in pursuing their studies at home and abroad.

* * * * * *

The foregoing sketch easily permits the conclusion that without the possession of a broad foundation of general knowledge, both theoretical and practical, Van Swieten's career could never have attained its epoch-making importance. To fulfil such a task, much more than mere professional eminence was required.

The principal work of Van Swieten, his Commentaries to the aphorisms of Boerhaave, have seen a number of editions in Latin, and have been repeatedly translated into the English, German, French, Spanish, and Dutch languages. The "Kurze Beschreibung und Heilungsart der Krankheiten, welche am oftesten in dem Feldlager beobachtet werden, Trattner, Wien, Prag, und Triest, 1758," was also translated into French, English, Dutch, and Spanish. A posthumous book was "Constitutiones epidemicæ et morbi potissimum Lugduni Batavorum observati, ex ejusdem adversariis edidit Maximilianus Stoll." Vienna and Leipzig, 1782, 2 vols.

His first publication was the inaugural dissertation, "De arteriæ fabrica," Leyden, 1725. I also find the title of an "oratio de senum valetudine tuenda," which was published in Vienna in 1778.

THE "MODERATOR BAND" AND ITS RELATION TO THE PAPILLARY MUSCLES, WITH OBSERVATIONS ON THE DEVELOPMENT AND STRUCTURE OF THE RIGHT VENTRICLE.

By Robert Retzer, M. D.,

(From the Anatomical Laboratory, Johns Hopkins University.)

The recent researches of Tawara (1) '06, have shown that the "moderator band" in the sheep, which he designates as simply "Muskelbalken," constantly contains the right branch of the conductive system. My own work (2), '07, confirms this. In a large number of pigs' hearts I have found the "moderator band" to consist of nothing but fibers of the conductive system, together with the constantly accompanying nerves and blood-vessels. In these cases, which formerly were called "hearts with fibrous moderator bands," the position was identical to that of the stout muscular band usually present. If the modified Purkinje fibers in the right branch of the conductive system have any power of contraction, it must be very slight, and in view of the fact that in the left ventricle identical cells certainly do not prevent any hyperdilatation of the ventricular wall, we can safely assume that the moderator band does not moderate, but is important only in so far that it contains the right branch of the conductive system. For reasons to be discussed later, I shall call it the "trabecula supraventricularis."

The constancy of this trabecula in some hearts and its absence in others led me to examine more closely the structure of the right ventricle. After examining over 200 pigs', 40 dogs' and as many human hearts, I came to the conclusion that the presence or absence of the trabecula was entirely due to the position of the anterior or large papillary muscle. It was only after this conclusion was reached that a search was made in the literature for the originator of the term "moderator band." Gould, in his Medical Dictionary, and other authors speak of it as Reil's band, but no mention of it could be found in any of the numbers of Reil's "Archiv für Anatomie," nor in the list of his published works. Many terms are associated, apparently without reason, with the name of this celebrated anatomist, and I doubt not that this is the case with the term "moderator band." In a further search in old books, I finally found an article, buried in Guy's Hospital Reports of 1837, by W. T. King (3), '37, entitled, "An Essay on the Safety-Valve Function in the Right Ventricle of the Human Heart, and the Gradations of this Function in the Circulation of Warm-blooded Animals," and on page 122 of this article, King says: ". . . . it seems calculated to limit distention, and therefore I have called it the moderator band of distention."

With the exception of McDonald Brown (4), '89, and Fothergill (5), '72, I find no reference to this most interesting contribution to the comparative anatomy and physiology of the heart, and in view of the fact that the old Guy's Hospital Reports are accessible to but a few anatomists, I shall take the liberty of reporting on it at length, quoting it verbatim.

King's study is arranged with especial reference to 300 or more preparations of hearts in the Museum of Guy's Hospital. The anatomical terms are as follows:

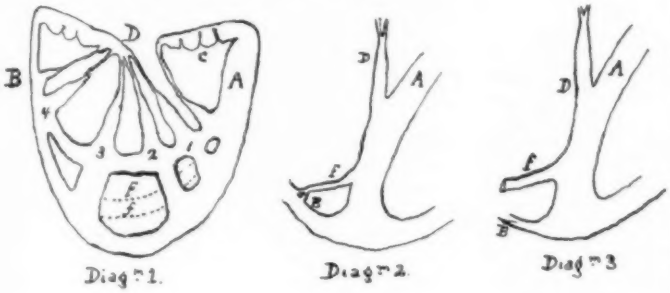
Column of distention	meaning	papillary muscle.
Curtain of distention	"	the valve on the parietal wall.
Solid wall	"	septum interventriculare.
Yielding wall	"	the anterior or parietal wall.
Moderator band of distention	"	trabecula supraventricularis.

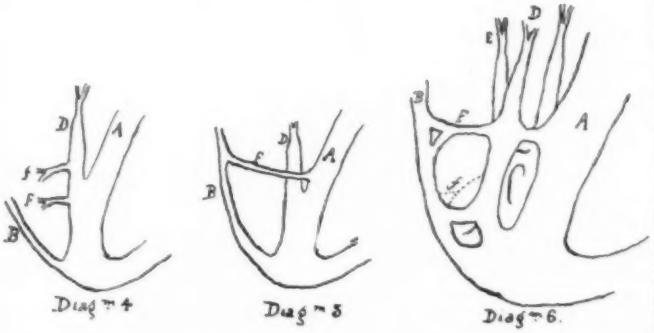
The paper consists of three parts, viz.:

I. Of the safety-valves in man.

II. Of the safety-valves in mammalia.

III. Of the safety-valves in birds.





It is the second part of this paper which is of interest to us, and it alone will be considered. It lies without the scope of this paper to discuss King's theory of safety-valve construction, but as his division into four series is based upon the degree of perfection of valvular closure, a word of explanation is necessary. King's idea is very clearly expressed in his diagram.

"Diagram 1 represents a section of the right ventricle, and is intended to illustrate the gradual change of position incident to the columns of distention in a succession of animals.

A. The *solid wall.*

B. The *yielding wall.*

C. The *fixed curtain* and its *cords* (one instead of many).

D. The *curtain* and *cords* of *distention.*

F. The *moderator band* (of distention).

f. The transverse dotted lines explain the gradual disappearance (the fading transitions) of the same *band.*

"The numerals refer to the various attachments peculiar to the *columns of distention* in the several orders of animals.

"In relation to the *moderator band,* the *columns of distention* (represented in each case as one) are attached internally towards the *solid wall,* as seen at 1; or they are attached externally towards the *yielding wall,* as shewn at 4; or their attachment is intermediate, as at 2 and 3, between the two walls and upon the *moderator band* itself, though also extending farther, to be attached to either wall.

"Diagrams 2, 3, 4 and 5 may serve to portray the four earliest stages in which the *column of distention* is found, as described in the first series of animals.

"In Diagram 2, the *column* (*D*) is small, most dependent on the *solid wall* (A); most remote from the *yielding wall* (B); and almost destitute of a *moderator band* (*F*). In the remaining three, there is seen a gradual increase of the column and band, and a greater inclination towards the yielding wall."

When the papillary muscles are situated at 1 or 2 (Diag. 1), no degree of dilatation of the ventricle can affect the closure of the valve, because the fibrous ring (at the angles *BD* and *AC*) remains constant as well as the position of 1 and 2. When the papillary muscles are at 3 or 4, however, it is evident that even slight dilatation will affect the closure of the valve, unless there is a compensatory lengthening of the papillary muscles in question. King's idea is that the trabecula supraventricularis (moderator band) will act as a check to dilatation, and keep the relative position of 3 and 4 constant.

"There exists, in the several orders, a *moderator band,* or cylindrical cord, of greater or less importance, traversing the cavity of the right ventricle, from near the center of the *septum* to the opposite point of the *yielding wall.* This *band,* which is generally considerable, seems of some use, as I have already explained, to moderate the degree of healthy dilatation; and it is found to be mainly connected with the *columns of distention,* which are attached about either of its extremities, or intermediately, as the case may be. The *curtains of distention,* by means of their *cords* and *columns,* are attached, in one case, to the left extremity of the *moderator band,* and into the *solid wall;* in a second case, they are secured to the middle part of the *band,* between the two walls; and in a third case, their attachments are into the *yielding wall,* at or near the yielding end of the *moderator band* (Diagr. 1).

"It will be evident that, in proportion as the *columns of distention* are attached close to the *solid wall,* they must be the less influenced by the yielding of the outer wall; and, on the contrary, it must be sufficiently apparent that the more the *columns of distention* are secured away from the *solid wall,* and near to the *yielding wall,* so much the more is the influence of distention left to operate freely in displacing the valves, and producing reflux.

"First, then, in certain instances it is found that the *curtain of distention,* or all that portion of the valve attached to the outer edge of the right auriculo-ventricular foramen, is secured by numerous cords attached about its floating edge; and that these cords are collected into the summits of two or more muscular columns, which are inserted into the *solid wall,* and therefore totally unaffected by any displacement of the outer wall. (See Diagr. 1, Column 1.)

"In the second place, or stage of progressive development, we may suppose the *columns of distention* inserted into the transverse *moderator band,* near the *solid wall;* in which case they

can be but slightly affected by the movements of the *yielding wall*. (See Diagr. 1, Column 2.)

"Thirdly, the *columns* are inserted into the same band, at a greater distance from the *solid wall;* and consequently more subject to the influence of distention; which, acting on the *yielding wall*, extends the *moderator band*, and carries out the *apparatus of distention*. (See Diagr. 1, Col. 3.)

"Lastly, the *columns of distention* are inserted into the *yielding wall*, at or beyond the corresponding attachment of the *moderator band;* in which case the results of distention are still more considerable. (See Diagr. 1, Col. 4.)

"The healthy dilatation of the right ventricle must of course result from the limited strength of the *yielding wall;* and it is necessary here to remark that the thickness of this part (most fairly estimated by comparison with the left) seems to vary considerably, both in quadrupeds and birds.

"Other elements of an imperfect safety-valve, which have been distinguished in the human heart, are also found to perform their part in the general animal series; namely, the form of the columns, the proportional extent of curtain, and the yielding nature of the auriculo-ventricular foramen, whose resistance, in all probability, is in equal proportion to that of the *yielding wall*.

"First Series.—I have said that the *columns of distention* may be inserted into the *solid wall*, more or less remote from the *moderator band*, whose office here appears to be of little consequence; and the band is therefore slight, or it merges almost imperceptibly into the union of the two walls anteriorly. . . . .

"This arrangement I have found to belong to most rodent, canine, and marsupial animals, and likewise to some others allied to them; but even this varied so gradually as to present a succession of stages, inclining to the more distinct form of a safety-valve adjustment."

(Here follows the description of the right ventricle of the hare, with a drawing.)

"In the hearts of this series, the *columns of distention* are usually more than two, and often as many as four, in number; and they increase in size from behind forwards, the posterior being comparatively insignificant. It is the anterior, or larger one, whose variations are chiefly remarkable. (Foot-note.—A still more anterior attachment of one cord can scarcely be considered a column.)

"The valve here, and in many hearts of the succeeding series, will not strictly admit the application of the term 'tricuspid,' since there is a little cuspid process, or curtain, between each two adjoining columns. The anterior column appears, in this series, to increase in size, nearly in the same ratio as the remainder decrease in number and importance. Its precise relative dimensions, together with the nature of its connection to the *moderator band*, are all the particulars here requiring attention.

"It will be seen, that in the hare all the *columns of distention* are planted on the *solid wall;* but it is necessary particularly to observe the attachment of the *anterior column* distinctly above the thin *moderator band*. (See Diagr. 3.)

"Now, in some other animals the *moderator band* is still less in size, and still more remote; until, perhaps, it altogether disappears. (See Diagr. 2.) But, on the other hand, tracing the series in the opposite direction, we see the *moderator band* rising to be inserted into the base (as at *F*) and even above the base of the *anterior column of distention* (as at *f*). (See Diagr. 4.)

"And, still farther on in the succession of gradations, the *moderator band* (or rather cord) has an insertion low down in the body of the *column*, and subsequently into the *solid wall* (see Diagr. 5); at the same time, we may perceive that the *column* is much increased in extent, which must give it a material influence over the *curtain of distention*, during its contraction.

"In classing the animals after their several proportions of safety-valve construction, the following is the order in which I should arrange this first series, including only the animals whose hearts I have been able to examine at least once, and for the most part oftener.

"In the rat the columns of distention are three or four; and the *moderator band* is a mere film, and very remote.

"In the rabbit the parts are the same; but perhaps the rudimentary *band* is proportionally somewhat more distinct.

"Next in order is the hare, as already described.

"Then follow together the kangaroo, the little bush kangaroo, and the opossum (*Didelphys vulpina*), all of which have apparently three *columns of distention;* and of these the anterior has an increased relative size, at least in the two first animals. Their *moderator band* is a cord inserted into the very base of the *column*, and is double at its external attachment.

"The bear has a construction like the preceding. Its *columns* are three or four, and the *anterior* is larger. The *moderator band* is a slight cord, divided externally, but inserted into the column immediately above its base. (See Diagr. 4, *f*.)

"The dog's heart is very little in advance of the last in the scale; and that of the fox is probably even less so. In an Australian dog, I found the *anterior column* divided at its base into two equal insertions; one of which was on the *yielding wall*, and was peculiarly remarkable for the traction which had manifestly been exerted upon it by an old and partial pericarditic adhesion at this point. (Foot-note.—A patch of pericarditic thickening on this spot is found in a majority of human adult hearts: it seems to be a part peculiarly liable to distention and attrition.) In another dog (a Spaniel) the second *column* was found bifurcated, and attached in a similar manner. Both these circumstances are probably very unusual."

King places in this series the following animals in the order given: Squirrel, guinea-pig, porcupine, mole, stoat, ichneumon and hedgehog. He states that in regard to these, as well as to the succeeding series, many gradations must be supplied.

Of this series I have examined the rat and the dog. In the one rat heart which I examined, there were three papillary muscles, the anterior very large and the two posterior of equal size, situated on the septal wall, but comparatively high up. The position of the papillary muscles alone justifies its place, as near the first of the series. The right branch of the conductive system was very marked, being a delicate, translucent strand, of about 0.5 mm. thickness, and passing over the crista supraventricularis to the base of the anterior papillary muscle, and then running back towards the posterior. This appearance of the branches and end-ramifications of the conductive system is quite characteristic of fresh hearts of this series and the following two. In the fourth series, which contains the hearts which have the most readily demonstrable Purkinje fibers, these delicate strands are accompanied on both sides by rows of fat cells. These give the net-work a grayish appearance. On closer examination, one can easily see the translucent strands, looking somewhat like blood-vessels, embedded in the fatty network. This translucency disappears in hearts that have been placed in the usual fixatives. It is probably due to the lack of the pigment, found in the cardiac musculature, and a large amount of clear sarcoplasm.

In the heart of the dog we have usually three papillary muscles, all situated on the septal wall, somewhat lower down towards the apex than is the case in the rat. The anterior is the largest and the posterior the smallest. When this last is failing, we have two or three smaller muscles, so small in some

cases that the tendons seem to arise from the septal wall itself. It is true that the term tricuspid does not properly apply to the valve. There is a large cusp on the outer wall and a smaller one on the septal wall. Anteriorly and posteriorly, these are connected to each other by smaller cusps (about 1 cm. attachment), but these may generally be considered as belonging to the valve of the outer wall. In all the hearts that I have examined, human, dog, rat and pig, there is, about 1 cm. to the back of, and superior to, the upper portion of the crista supraventricularis, a very small papillary muscle; or the tendons, three or four in number, arise from the wall itself. These tendons attach to the cusp which is also supplied by the large anterior papillary muscle.

The conductive system in this case passes along the crista supraventricularis, recognizable by a slight elevation, and after reaching a point opposite to the base of the anterior papillary muscle, runs backward and parallel to the annulus fibrosus, sometimes bridging across the depression between the anterior and middle papillary muscles in the form of a trabecula 1 mm. in thickness.

In one case I have found two papillary muscles, the anterior very large and double, situated on the outer, and one of fair size posteriorly on the septal wall. The appearance of the right ventricle was much like that of the pig's heart. The crista was replaced by the trabecula supraventricularis, as would be expected. This is a very rare anomaly in the dog's heart. The valves of the heart tore upon removal of the blood clot, and it could not be established whether the arrangement in this case was the truly tricuspid form, as is the case in the pig. The left ventricle did not differ from other dogs' hearts.

"SECOND SERIES (King).—In the hearts of a second series of animals, the *anterior column of distention* is of full size, reaching to the extremity of the *yielding wall;* and the *moderator band* is considerably developed, particularly in the most advanced grades; and in some we see, moreover, the *second column of distention* following the same course of development. (See Diagr. 6.)

"The appearance of a *moderator band*, in relation with its *second column*, rarely seems to become very significant, or deserving of attention. A third *column* is usually found, but it is of small size: thus the curtains are more liable to displacement, by reason of the extent of the *columns*, and their insertion occasionally into the *yielding wall*, together with their increased freedom from the *solid wall*, through their connection with the *moderator band*. . . . .

"The feline animals seem to be the first in this series. The cat has one considerable *column of distention*, based near the *yielding wall*, and traversed by the *moderator band*, which adheres to it, and confines it within a short range of the *solid wall*. (As Column 2, Diagr. 1.) In the same animal, I have seen the *second column* also inclining to this disposition. The valve of the gennet cat strictly resembles that of our domestic animal. In the yaguarundi, the *anterior column* is perhaps still more confined. The burrowing marsupial wombat seems to be analogous to these last, rather than to the kangaroos, as relates to its safety-valve.

"The ocelot offers one increased degree of enlargement of the *moderator band*, and freedom of the *anterior column*, without any other visible alteration.

"The leopard has the *anterior column* still more free; and the *second column* is lengthened, and a good deal more free than the corresponding pillar in the preceding animals, as if loosening itself from the solid wall. (See Columns 1 and 2, Diagr. 6.)

"The lemur probably belongs to this series. Its *first column* has, however, less freedom even than that of the cat, the *moderator band* being, externally, very slight, but the *second column* is considerable, and seems almost exclusively to belong to the yielding wall."

Two hearts of this series came under my observation, one of an adult cat, and one of a new-born kitten. In the adult there was one large papillary muscle, that was double and situated, as King says, "based near the yielding wall." The second and third papillary muscles, the latter very small, were situated, however, on the septal wall. There was a very thin trabecula supraventricularis, but this continued in back of (that is, toward the septum) the large anterior papillary muscle to the middle one. This marks a different stage from that of the dog, that is, the tendency of the papillary muscle is towards the outer wall.

I admit that is not safe to judge from one specimen, but the new-born kitten that I examined had three papillary muscles, the two anterior of equal size, the posterior very small, and all situated on the septal wall. Macroscopically, I could not trace the conductive system further than the anterior muscle. If this is the usual condition in the embryo cat, then we should have here, ontogenetically, what King has demonstrated so well in a phylogenetic series.

"THIRD SERIES (King).—In pursuing these gradations of valvular development from the last named, that of the lemur, we should perhaps rank next all the genera of quadrumana; but the varieties which their tricuspid valves present are too considerable to admit of decided arrangement in this place. Some may probably require to be classed amidst the preceding series; and others may claim a place (according to the amount of their safety-valve action) even beyond that of the human; which, for the present, is placed immediately after them, man and the quadrumana forming a distinct third series. (As represented by the column 3, Diagr. 1.)

"After studying the structure in many quadrumana, I find it impossible at present to distinguish, in a satisfactory manner, the differences which it assumes in them. The thickness and capacity of their right ventricle differ much. The *moderator band* is visibly and progressively coming forward. The *columns of distention* are about three in number; but the two anterior of them only are considerable, and more or less inclined to the *yielding wall*. The variations which the *columns* present in different genera, and perhaps even in different species, with regard to length, size, and freedom from the solid wall, form a little set of transitions of considerable interest for future inquiry.

"The parts in the orang satyrus (*Simia s.*) may serve, perhaps, as a specimen of the medium characteristics of the valve in these varied tribes of animals.

"The tricuspid valve of the chimpansee is rather more like the structure in man; and, if we may judge from the extent of its *anterior column of distention* and *moderator band*, it will be found to possess a degree of safety-valve action exceeding that of the human heart.

Both these simiae have their right ventricles capacious and thin; but that of the last appears strong.

"The next gradation, in an advancing series, would probably be occupied by the human valve. . . . . The anterior or *first column of distention*, with its *moderator band*, may be regarded as a constant formation.

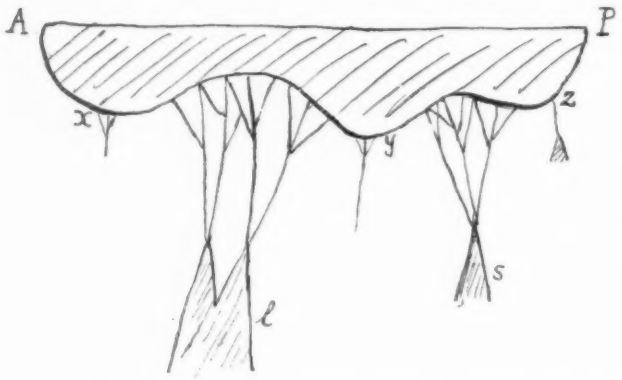
"A *second column* exists almost as uniformly, and often a third; but these columns of distention vary a good deal in size and arrangement. Frequently, the *first column of distention* is distinctly double; and sometimes there is a second *moderator band*.

"The length of the *columns of distention* is probably of very considerable importance. The *first* or larger column, in particular, sometimes reaches actually into the apex of the ventricle (see *D*, Diagr. 4). . . . .

"At this point I am again desirous to call attention to the fact, which I formerly more fully exposed, that the human heart, subsequent to birth, follows the gradations hitherto described. The gradual wasting (so to speak) and dilatation of the right ventricle slowly withdraw the *columns of distention* from the vicinity of the *solid wall*."

I have been unable to find any reference to the allusion in the last paragraph, either in this paper or in the previous volume (Vol. I) of the Guy's Hospital Reports.

Of this series only the human heart was at my disposal. To establish the norm in this case is exceedingly difficult. The anterior papillary muscle is very large and controls practically the whole of the free cusp. There is usually a second, small



papillary muscle, which is situated midway between the anterior column and the posterior angle of the ventricle. These papillary muscles arise as independent projections from the dense network of columnæ and trabeculæ carneæ, which fills up the lower (apical) portion of the ventricle, sometimes being placed nearer the septal wall, sometimes high upon the outer wall. The large papillary muscle is quite frequently double, and even triple, and in these cases the posterior usually becomes more insignificant.

The tricuspid leaflets are generally four in number, next in frequency two, and more rarely three. When looking down from the atrium upon the atrio-ventricular opening, we can see the short line of attachment of the septal cusp, and a large crescentic line forming the attachment of the rest (external portion) of the valve. This crescent is usually without a break, and cuspid divisions are not seen. Upon cutting open the ventricle, the division of the cusps can clearly be differentiated, but not as is usually pictured in the text-books. The condition is diagrammatically represented in the figure above.

At *A* the external portion of the fibrous ring *AP* passes into the septal portion anteriorly, and at *P* it passes into it posteriorly. Near *A* the tendons arise directly out of the septal wall, while near *P* the tendons arise from a papillary muscle. These are frequently absent. The papillary muscles *l* and *s* are situated opposite the indentations of the valve and send the strongest and largest number of tendons to these. At *x* and *y*, tendons, very thin and long, that arise from the septal wall itself may be attached. The cusps, therefore, are situated between the main insertions of the tendons of the papillary muscles, and in the human heart there are usually three of these, composing the external leaflet. When the cusps are not so marked, we have two, and in this case *z* is the one to disappear.

The trabecula supraventricularis usually does not exist in the human or dog's heart, but in its place we have the crista supraventricularis (*BNA*). This crista is probably better marked in the human heart than in any other. We have but to consider the crista undermined in its lower portion, and a trabecula will result. It marks the division between the ventricle and the conus arteriosus; hence, its name. Not infrequently the right branch of the conductive system, which always passes along the edge of the crista or trabecula supraventricularis, beneath the endocardium, or sometimes beneath a layer of myocardium, continues on to the small posterior papillary muscle as a thin strand, formerly called a "false" tendon. So we see that here again King's descriptions are absolutely correct. In those cases, however, when the large muscle has shifted to the outer wall, then we find not a crista but a trabecula supraventricularis.

"Fourth Series (King).—(See Column 4, Diagr. 1.) A fourth series of animals is found, in which a valve of a truly tricuspid form is commonly seen; and in which, for the most part, one large *column of distention* is implanted into the outer wall, and generally with a long and free *moderator band*. But all these parts, in the fourth series, are subject to considerable progressive changes. The *curtains*, which, in their simplest form, begin to resemble the crescents of birds, may, on the one hand, shew a tendency to the bicuspid form; or, on the other, the number of divisions may be found increasing.

"The *column of distention* may be of good length, or short; and in the extreme case, the *cords of distention*, from 6 to 12 in number, appear actually to have insertion into the *yielding wall* (being, as it were, sessile). In this case the *curtains* are uncontrolled by any proper muscle. It is not, I think, to be supposed, that here the *columns of distention* (as such) are diminishing in number or importance, but rather the contrary; for the single column is more properly the union of a number varying between two and six or seven; and this union cannot interfere with the direct outward traction of each one, since the column is now become a little wall, parallel to the inner surface of the *yielding wall*, and having the *cords* inserted into its upper edge. This edge consists of a little chain of nipples—the disunited summits of two or more columns, each drawing outwards in nearly an equal degree.

"The most remarkable form of a *moderator band* is that in which this part is inserted close before the base of the *compound column of distention*, the opposite attachment being beneath the most anterior of the *fixed cords* on the *solid wall*. In this case, the *band* is muscular and cylindrical, but long and slight. It is very yielding, and seems to possess a peculiar elasticity. It is already declining in efficiency. It is evident that it can least

control the most posterior parts of the column of distention. In the transition through which the band may be traced in this series of animals, it either gradually wastes, or slowly removes itself; and becomes more short and muscular, until it is nearly lost in the anterior and inferior junction of the two walls. Now here, where the simple effect of distention is greatest, the moderator band is ceasing to have any distinct office; and thus we found it circumstanced in the first gradations, where the *columns of distention* were immovable, and the *moderator band* a mere thread.

"I have taken the sheep and goat as typical of the present series. The column of distention has, perhaps, a greater proportional development, as to width, in the first, the *cords*, as well as the original number of *pillars* (now united), being increased, and also, as I presume, the liability to valvular displacement. The gazelle resembles the goat; but its *moderator band* is manifestly leaving the *column of distention*. With it are the harnessed antelope and the axis-deer, according to my specimens. The reindeer possesses the compound *columns of distention* in the greatest development, in breadth as well as in the number of cords and muscular points or nipples; but its moderator band has its insertion still more inferiorly than in the gazelle.

"The ox has for a *column of distention* a short kind of mastoid process, over which the cords have scattered insertions; and both the horse and ass (I have found the proportion very similar in two zebra's hearts likewise) possess a little prominent *column*. In all these the *moderator band* is placed low, and very much as in the gazelle; and it is, for the most part, scarcely muscular, but long, slight, and yielding, and often almost disappearing, as it were by atrophy. Sometimes there are two thread-like cords only. On occasions, however, the *band* might appear to be of importance, being of great thickness and moderate length; but then it is placed farther distant from the *column;* and, as I have found it attended with an unusual degree of hypertrophy in the cavity, and elongation of the column, I regard it as a part of a congenital excess of power in this cavity altogether. Under all circumstances, it appears only as an exception.

"The valve of the pig much resembles that of the sheep; but the cords and points in the *compound column of distention*, as well as the *moderator band*, are somewhat less considerable. The cavity seems capable of much enlargement.

"The llama and camel present very interesting gradations. The first has a bifid *column of distention*, with pretty numerous *cords;* which seems to explain the opinion that the broad column is formed by the aggregation of several parallel pillars; as if a succession of single columns left the *solid wall*, posteriorly, to augment the breadth and traction of the *compound column* in several different degrees or gradations. Here, and in many of these animals, the most posterior of the *fixed cords* are beginning to have a distinct muscular column. In the llama, also, the *moderator band* is muscular and of good size, but very unfavorably placed to affect the *column of distention*: it is very near to the anterior union of the two walls. In length of its *column*, and the remoteness of its *moderator band*, the camel would appear to stand midway between the reindeer and the lama—at least, if I may judge from a single, and not a very favorable specimen. (Footnote.—The right ventricle of the giraffe possesses a valve of a very simple tricuspid form. The single *column of distention* is of little width, conical, and somewhat lengthened. Its cords seem few, and little scattered on the summit. The *moderator band*, long, and of inconsiderable thickness, is placed nearer the single column than in the llama and camel. One posterior fixed column is considerable.)

"According to its valvular formation, the seal requires a place among the fourth series of the mammalia. It has a *moderator band* of rather less efficiency than that of the llama, but its compound *column of distention* may be said to be triple. It is large, irregular, much divided, furnished with many cords, short, and based upon a thin cellular wall. The posterior *fixed cords* possess a considerably muscular column. The cavity admits of much extension. This animal has some slight tendency to a divison of the ventricles in the form of a bifid apex; and seems to be allied by this, as well as by its habits, to those warm-blooded and respiring aquatic animals, in whom the separation of the ventricles is more distinct, as in the porpoise, and still more in certain other cetacea."

Of this series I have examined the pig and sheep. In the latter the anterior papillary muscle is indeed very flat, and from it arise from 8 to 12 tendons. There is a posterior papillary muscle, very short and arising with a broad base high up on the septal wall. The tendons arising from this muscle, 4 or 5 in number, attach to both the septal and the outer leaflet. The valve is truly tricuspid, showing distinctly that the indentations are situated opposite the papillary muscles and the broad surfaces of the valves between them. The trabecula supraventricularis is well marked. In the pig, the conditions are very similar. The heart itself is not so conical in shape as is that of the sheep, and contains less fat in the epicardium and endocardium. The posterior papillary muscle is sometimes double, and in this case the more posterior portion furnishes the tendons for the outer leaflet.

Before we look into the development of the crista supraventricularis and papillary muscles, it is well to present the views of a few more authors. In his "Harveian Oration" Rolleston (6), '73, describes his discovery of the moderator band in the Australian cassowary (*Casuarius Australis*), which has a homologous position to that in the sheep. He also makes a good comparison in the appearance of the large papillary muscle, crossed by slender fibrous bands at right angles (the right branch of the conductive system) to the corpus callosum crossed by the striæ longitudinales. "This band of fibres can sometimes be traced up towards the conus arteriosus, and be seen not to die away until close upon the point of origin of the most anteriorly or upwardly placed chordæ tendineæ arising from the septum to pass the hindermost of the three segments of the tricuspid." And then he shows that these striæ are homologous to the "moderator band," which may "raise itself from the position of fusion" and "assume the character of a cylindrical band for a lesser distance."

Bands stretching across the ventricle have been known before King's time, as is shown by the description of Bell (7), '26. Cruveilhier (8) describes the trabecula supraventricularis, to which he fails to give a name, as being the line of division between the atrial and pulmonary orifice. Testut (9), '93, follows this same description. Poirier (10), '01, calls it "bandelette ansiforme," and besides making it the landmark of division between conus and ventricle, he ascribes to it the prevention of hyperdilatation. An extensive monograph by Sée (11), '74, makes this band analogous to the "demi-sphincter" which replaces the tricuspid valve in birds. This seems to be in agreement with Rolleston, but differs from King's opinion, who looks for "the rudiment of a moderator band among those little pillars which assist to connect the

two walls opposite to the crescent of distention anteriorly" (p. 164). Although the paper shows a great deal of anatomical work, and an examination of the hearts of dog, ox, horse and man, yet he fails to make any remark upon the position of the papillary muscle. This applies also to Brown (l. c.), who examined the hearts of edentata, ungulata, sirenia, cetacea, rodentia, carnivora and primates.

Recently Horand (12), '08, published a paper on the "*faisceau arqué,*" or "moderator band," which shows the results of the study of 120 human hearts. Horand divides it into three groups: (I) *Faisceau arqué libre,* (II) *Faisceau arqué partiellement libre* (classic type), (III) *Faisceau arqué complètement adhérent,* and bases all variations on the nearness of the insertion of the anterior papillary muscle. He quotes Testut that it is present in 70 to 80 per cent of cases. He also ascribes a "moderator action" to it.

Various authors, Turner (13 and 13a), '93, '96; Rolleston (14), '97; Huchard (15), '93; Browicz (16), '96; and Horand (17), '08, mention a "moderator band" in the left ventricle. This band is easily accounted for when we consider its function, namely, to conduct the impulses from the sinus or atrium to the ventricle in a given time. The left branch of the conductive system spreads out beneath the endocardium at an angle of about 30° from a point situated 0.5 to 1 cm. below the junction of the posterior and right semilunar valve to the two papillary muscles. When these are situated some distance from the septum, the conductive system will stretch across the ventricular cavity instead of reaching them by way of the septum and numerous large trabeculæ and columnæ carneæ at the base of the papillary muscles.

The further literature on "moderator bands" and intraventricular bands in general is not very extensive, and its contributors have been mostly clinicians, who saw in them an explanation for certain musical murmurs: (Huchard, l. c.; Browicz, l. c.; Rössle (18), '02; Galli (19), '04). It is not for me to discuss this side of the subject, but judging from a purely anatomical standpoint, I think it very unlikely, because most of the bands are not tense enough, especially during systole. The autopsy shows frequently other lesions, and we have but to call to mind that it takes but a very slight aortic insufficiency to produce a musical sound, to make us skeptical in the belief that these bands produce murmurs.

In connection with the pathology of the conductive system quite a discussion has arisen lately about the significance of these aberrant strands in the ventricles. Before the time of Tawara the general concensus of opinion was that all aberrant bands acted as moderator bands and contained sometimes connective tissue, sometimes ventricular musculature. Tawara (20), however, claimed that every aberrant tendon, in both the left and the right ventricle, was but a pathway or bridge for the ramifications of the conductive system. Mönckeberg (21 and 21a), '08, however, has come to the conclusion that these aberrant tendons (*sogenannte falsche Sehnenfaeden*) are of four kinds which are to be divided into two groups, each with two subdivisions.

A. Strands which have nothing to do with the atrio-ventricular bundle.
   1. Strands which contain no musculature (real aberrant tendons).
   2. Strands which contain ventricular musculature.

B. Strands which contain abnormally directed fibers of the left branch of the atrio-ventricular bundle.
   1. Strands which contain atrio-ventricular fibers exclusively.
   2. Strands which contain also ventricular musculature.

The group A belongs to the upper part of the septum, between the undivided branch of the left branch, and the anterior mitral cusp. To group B belong such tendons that leave the septum beneath the anterior portion of the septum membranaceum, or the anterior aortic cusp.

The question whether a trabecula contains branches of the conductive system can readily be decided, at least in the pig and dog, by employing the following method: A fresh heart is put into almost boiling water, and allowed to remain there until the tissue is thoroughly soaked and becomes hard. It is then put into an emulsion of carbolic acid and water. Almost immediately the subendocardial ramifications will stand out as white strands on a gray background. If the hearts are kept in this emulsion, which will gradually separate into two layers, for a month or more, the myocardium will turn dark brown, and the ramifications will appear very distinctly as gray strands on a dark background. This method has also a selective action for nerve fibers, for which it was used in a modified form by Shuk (22). The hearts will not stand long exposure to air, and I am at present trying to bring the hearts into a solution that is not so disagreeable to handle as carbolic acid is. I have no explanation to offer for this phenomenon. It may be that the nerve fibers which always accompany the sino-ventricular bundle[1] take on the same appearance in the endocardium as they do in the epicardium.

With this method, it is evident that, in the pig, so-called false tendons are always bridges for the conductive system. By conductive system I mean not only the sino-ventricular bundle, but also the accompanying nerve fibers. It is easy to trace the delicate ramifications; in the right ventricle a hand lens is necessary, and one can see that some of the branches high up on the septum are really a part of the end-ramifications and not branches which come off directly from the main branch. In the human heart the sino-ventricular bundle is so poorly differentiated that it is no wonder that Mönckeberg did not recognize the bundle, especially where he was dealing with the recurrent branches.

[1] As the development shows that the bundle arises from the sinus and not from the atrium, I have suggested the name sino-ventricular instead of atrio-ventricular bundle. The sinus in the adult comprises the greater part of the right atrium; namely, the whole region between the venæ cavæ posteriorly, and inferiorly, the limbus fossae ovalis on the left and superiorly, and the valves of the inferior vena cava and coronary artery near the ventricular orifice. (Retzer (23), '08.)

We have now considered the structure and position of the papillary muscles of the right ventricle and the relation that the right branch of the sino-ventricular bundle bears to them in the adult. The study of the embryonic conditions will help to bridge over some of the gaps, and give us a clearer understanding of the causes underlying the structure. My study is based on the pig embryo. In the heart of an embryo of 5.5 mm. the musculature of the ventricles forms a spongy network with wide meshes. The outer wall consists of a two-cell layer of poorly differentiated musculature and at this stage the endocardium has become adherent. At 6.5 mm. there is an enormous increase in the trabecular network, with a decrease in the size of the meshes, and a thickening of the outer wall. The division between right and left ventricles is well marked externally by the sulci longitudinales and interiorly by the more compact trabeculæ which give rise to the septum ventriculorum. At 20 mm., although the foramen interventriculare is almost closed, there are free communications between the right and left ventricles through the wall of the septum itself, as injections into the ventricular cavity and subsequent corrosions will show. There are no large cavities to the ventricles until later, when the approximation and consolidation of the trabeculæ take place. A portion of these trabeculæ remain prominent and project into the ventricular cavity. These become the papillary muscles and trabeculæ carneæ. In the case where there is a trabecula supraventricularis this develops in the same manner.

The thickness of the walls of the right and left ventricles is about the same in the embryo, but the right ventricular cavity is considerably smaller. The conus arteriosus is very large and remains larger than the right ventricle until birth, when the increased activity of the ventricle and the diminished activity of the conus cause a reversal of this condition. The conus of the early embryo is not free of trabeculæ, but these soon flatten out against the wall and at birth remain as columnæ carneæ. The position of the papillary muscle remains the same in the embryo as it does in the adult. There is no shifting from the mesial (septal) to the outer wall. This is very important, for it at once dispels the idea that it is secondary and due to increased pulmonary pressure, as King suggests.

King's observations, which have been verified independently by my own, form an interesting contribution to the comparative anatomy of the right ventricle. I fail to find an explanation why the human heart (Series III) should stand between the dog's (Series I) and pig's (Series IV), but no doubt there is some physiological reason. It cannot lie in the habits of the animals. Hand in hand with these differences in gross structure and relations go changes in the histological appearance of the conductive system. The Purkinje fibers were discovered in Series IV, and their presence in Series I and II was denied for many years.

If we consider the crista or trabecula supraventricularis as the dividing line between the right atrium and conus, and our embryological studies bear this out, it seems that the hearts of Series I have a larger conus than those of Series IV, and II and III lie intermediately. There are frequent exceptions to this rule, but always when there is an unusual number of columnæ carneæ. The smoother the internal surface the larger the conus, a fact which may be due to the greater strength in those hearts with columnæ. There are certain of these columnæ in Series I and II which stand out very prominently, and are either absent or poorly developed in the adult III and IV, although well marked in the embryo of the latter series. Importance is attached to them by some physiologists.

When we consider the presence or absence of the valvula venæ cavæ inferioris (Eustachii) or the position of the semilunar valves (which probably indicates the size of the constrictors of the aorta and pulmonary aorta), the series fail us.

It seems unlikely that hypertrophy of the right ventricle can affect the position of the papillary muscles, as some authors claim; but it seems logical to suppose that the valve of Series I is more efficient than that of III and IV. It is well for the experimentalist to take this into consideration and not deduce conclusions for the human heart when the observations have been made on the dog's.

This study has been entirely upon the right ventricle, and adds but a small contribution to our knowledge of the intricate structure of the heart. The variations here are as great as they are in any portion of the vascular system, and it takes time and an abundance of material to establish a norm. Until this has been done, we can but poorly appreciate the many changes brought on by extraneous influences.

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THE EFFECT OF SCARLET RED, IN VARIOUS COMBINATIONS, UPON THE EPITHELIATION OF GRANULATING SURFACES.

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This paper has as its basis the observations made during the treatment of 60 cases with scarlet red.

Chemical Structure.—Scarlet red, or Biebrichs scarlet red, was discovered in 1882, and is an anilin dye which stains silk and wool a brilliant scarlet color. It is a disulphonic acid derivative, and the dye on the market is the sodium salt of the staining acid, and is in the form of a powder. It is made from diazoazobenzoldisulphonic acid, and β naphthol, and has the formula:

$$C_6H_4(SO_3Na) - N = N - C_6H_3(SO_3Na) - N = N - C_{10}H_6OH(\beta).$$

Experimental Use of Scarlet Red.—Fischer of Bonn, in his paper on "Experimental Generation of Atypical Epithelial Proliferations," etc., published in 1906, called attention to the fact that when a saturated solution of scarlet red in olive oil was injected subcutaneously, an inflammatory condition was produced, and there was also an increase of mitosis in the germinal layer of the skin, as well as in the hair follicles and skin glands.

He was able to produce this proliferation in the skin only, and from this was led to believe that scarlet red acted as a specific attraxin upon the surface epithelium. He found that the new formation of epithelium caused by the injection of scarlet red oil, which very markedly resembled skin carcinoma, showed no tendency for independent aftergrowth, and kept up only as long as the injections were made. When these were discontinued the new formation retrograded and degenerated into epithelial pearly bodies. This suggested to him that it might be used therapeutically.

Helmholz, in 1907, was able to produce similar epithelial proliferations in the skin, and in addition succeeded in creating a like growth in the mouth and rectum. He thought that with the technic as finally developed, he could get the same results in the stomach, intestines, etc.

The positive results in the mucous membranes of the mouth and rectum would rule out the idea of Jores that the presence of hair follicles was necessary.

Helmholz found that there must be close contact between the scarlet red oil and the epithelium, in order that any reaction take place. He believed that scarlet red could hardly be claimed as a specific attraxin, but rather something that by interaction with the connective tissue produced a soil that was ready for epithelial development. He also showed that the cylindrical epithelium in these experimental tumors remained so only as long as it lined a lumen, and when it formed in masses it changed to the squamous type, and just as readily returned to the cylindrical type when lumina formed in the epithelial masses. This metaplasia showed how different the process was from carcinoma, in which the character of the cells remains constant.

Werner, in 1908, found that concentrated scarlet red oil, injected into carcinomata of mice, stimulated the growth only while the injections were continued, and from his experiments came to the conclusion that the proliferation was not due to a chemotactic influence on the cells, but occurred through the imitation of the same.

The above brief mention of the action of scarlet red oil, when injected subcutaneously, will give an idea of the theories brought forth as to the cause of the epithelial proliferations. I shall not discuss their relative merits here, but will simply take up the clinical results obtained by the local application of scarlet red, in various combinations, on granulating wounds, in order to hasten epitheliation.

From the experimental work mentioned above, and from the results of the therapeutic action so far reported, it seemed perfectly safe to use scarlet red externally for therapeutic purposes, without danger of producing carcinoma. My own investigations have, so far, confirmed me in this belief.

The only literature on the therapeutic use of scarlet red is as follows: Schmieden was the first to apply Fischer's sug-

FIG. 1.—Traumatic ulcers, 11 x 5 cm. and 5 x 2 cm. Age of patient, 76 years. Duration, 3 months. (*A*) Taken January 27, when treatment was begun. (*B*) Taken March 22.

FIG. 2.—Ulcer following operation for infection of forearm and wrist. Largest diameters 15 x 5 cm. (*A*) Taken January 27, when treatment was begun. (*B*) Taken January 29. The stimulation of the epithelial edges is well shown in this picture, and measures 4 mm.

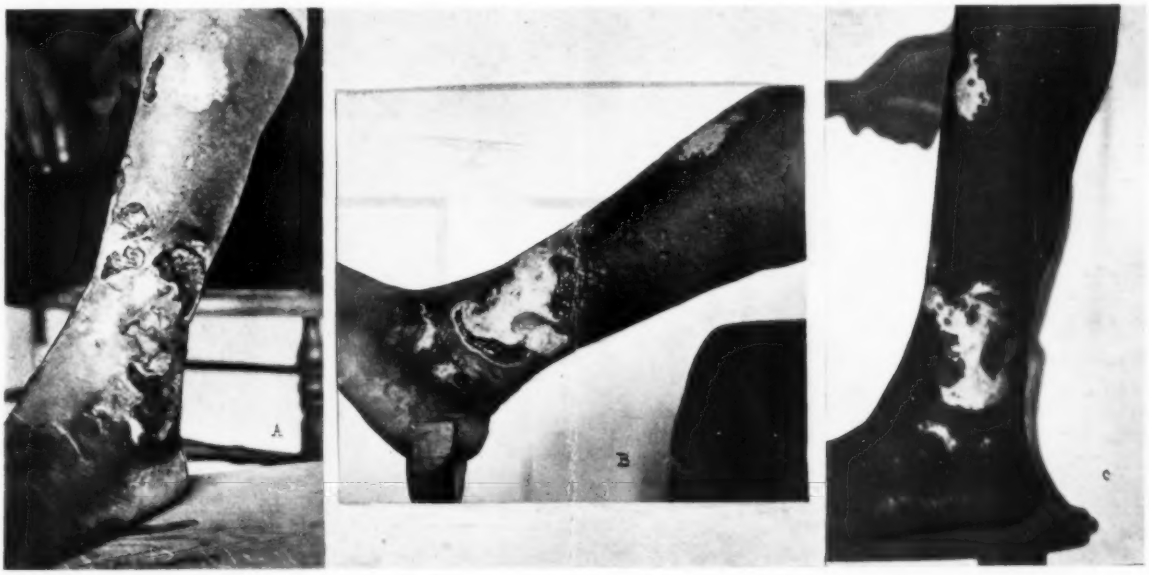

FIG. 3.—Multiple specific ulcers on outer side of leg of negro. Duration over one year. Ulcers, 4 x 2 cm., 6 x 4 cm., 8 x 3 cm. (*A*) Taken November 25, 1908, when treatment was begun. (*B*) Taken December 9. (*C*) Taken February 4, 1909. Note return of pigmentation in newly formed skin (*C*).

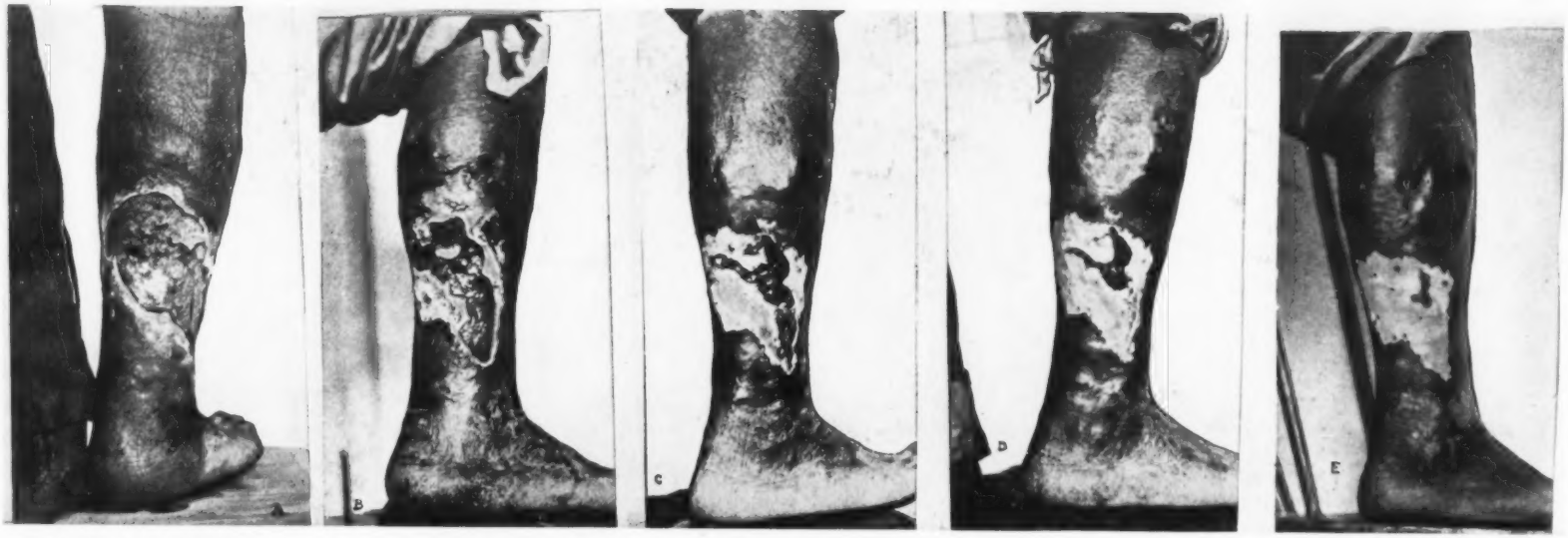

FIG. 4.—Varicose ulcer, 15 x 9 cm. Duration several months. (*A*) Taken October 16, 1908, when treatment was begun. (*B*) Taken November 18. (*C*) Taken December 18. (*D*) Taken January 2, 1909. (*E*) Taken February 10. *A* to *C* show the stimulation of the lower left hand portion of the skin edge. Note return of pigment in new pink skin in *E*.

FIG. 5.—Ulcer following excision of epithelioma, 6 x 5.5 cm. Bone exposed. (*A*) Taken January 11, when treatment was begun. (*B*) Taken March 17. Difficult to make out the edges of the scar.

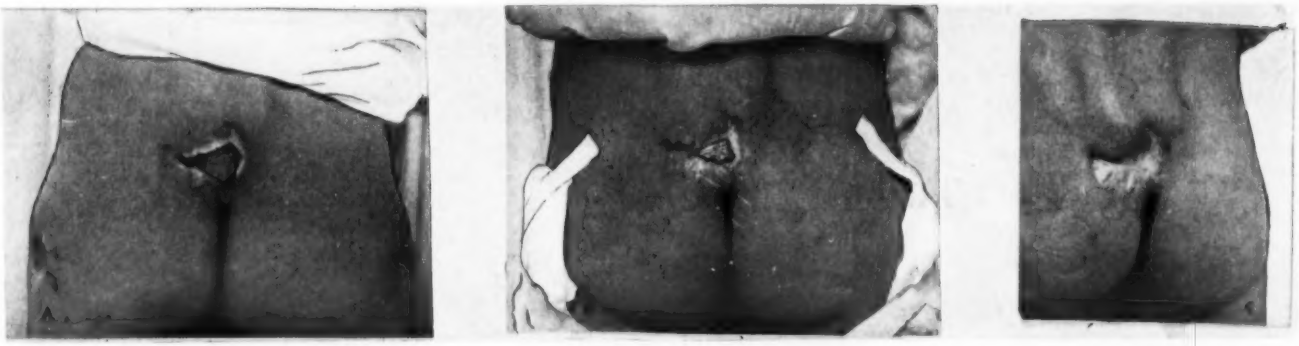

FIG. 6.—Bedsore following typhoid, 3 x 5 cm. Duration several months. (*A*) Taken November 6, when treatment was begun. (*B*) Taken November 18. (*C*) Taken December 7.

FIG. 7.—Ulcer following operation for infection, 9 x 3 cm. Duration, 1 month. (*A*) Taken December 30, 1908, when treatment was begun. (*B*) Taken January 8, 1909. (*C*) Taken January 15. Measure on final healing, 6.5 x 1.5 cm.

FIG. 8.—Ulcer following injury with subsequent deep infection. (*A*) Taken December 4, when treatment was begun. (*B*) Taken December 14.

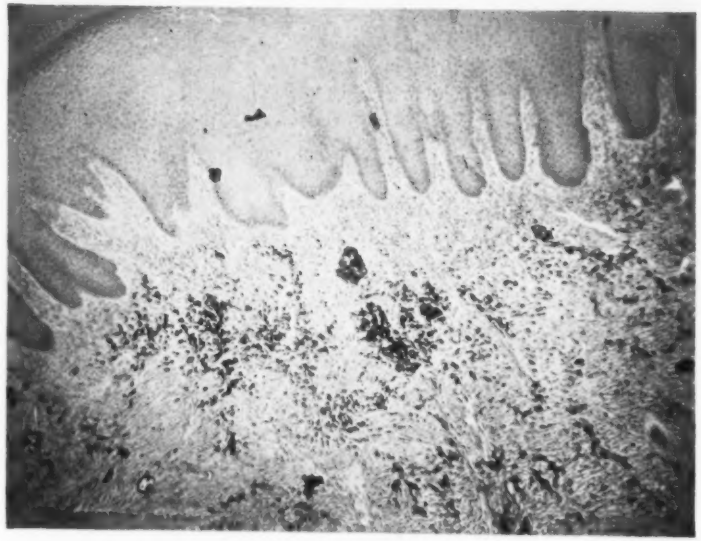

FIG. 10.—A small portion of Fig. 13 under higher magnification. Note the papillary formation and the thickness of the stratum Malpighii. The masses of pigment cells in the deeper layers of the skin are interesting from the fact that the newly formed skin is pink and shows no pigmentation, while in certain portions of the section, where it passes through an isolated pigmented spot in the pink skin, there seems to be a definite relationship between the pigment in the deeper layers and that in the cells of the stratum Malpighii.

FIG. 9.—Section of negro skin, formed under Scarlet Red treatment, on a chronic varicose ulcer of the leg. The end (*A*) is 2 mm. from the growing epithelial edge. The end (*B*) is a portion of the normal surrounding skin and shows pigment in the deep layers of the stratum Malpighii. At (*B*) the papillary formation is not especially noticeable and the stratum corneum and Malpighii are about normal thickness. As we follow the surface toward (*A*), the papillary formation becomes more marked. All the layers of the epidermis become much thicker, and under high power intense cell division can be seen.

gestion, and published a paper on "Epithelial Growth under the Effect of Scarlet Red" early in 1908.

Kaehler, in May, 1908, and Krajca, in September of the same year, and also Cernezzi, in February, 1909, published enthusiastic articles on this subject, with modifications of Schmieden's technic.

Wolfrum and Cords, in February, 1909, reported favorable results on corneal ulcers with scarlet red salve.

Being stimulated by these papers, and having an opportunity to treat and observe a number of granulating wounds in the Surgical Out-Patient Department of the Johns Hopkins Hospital, I began a series of experiments with the scarlet red.

A few of the cases thus treated were house cases in the Johns Hopkins Hospital and at the Union Protestant Infirmary, but the greater number were those in the Out-Patient Department. These cases were not selected, and the wounds for the most part were very unsatisfactory to start with. Many were chronic ulcers of various varieties, belonging to the class of wounds upon which Schmieden stated the treatment with scarlet red was useless.

A large number of these patients continued their daily occupations, and thus the factors of rest and regular attendance could not be counted on. In fact, a more severe test of a treatment could scarcely be applied.

The dye employed was that manufactured by the Badische Company, of Ludwigshafen, Germany, which is sold in 1-pound cans, and is inexpensive.

In the experiments, I have used 2, 4, 5, 8, 10 and 20 per cent scarlet red ointments, with a simple vaseline base. As I have been unable to observe any antiseptic properties in scarlet red, I had the following antiseptic ointments of U. S. P. strength made up in vaseline, and containing 8 per cent scarlet red:—boric, zinc, iodoform, blue, and an ointment consisting of balsam of Peru, 1 drachm, to vaseline 1 ounce. On several occasions I have dusted small wounds with the pure powder.

The ointments were prepared by rubbing up the scarlet red with a small amount of olive or castor oil, until a smooth mass resulted, and then this mass was thoroughly mixed with the base.

Sterilization of the ointment caused the color to become somewhat darker, but this change did not seem to affect the stimulating power of the preparation.

Technic.—Clean, healthy granulations should be bathed with boric solution and dried. Should the granulations be unhealthy, peroxid of hydrogen is used in addition, before the boric solution. I have found it best not to use bichloride of mercury or other strong antiseptic solutions on the wound before treating it with the scarlet red. Free use of nitrate of silver stick is advisable to keep down exuberant granulations.

The skin surrounding the defect should be anointed with some bland ointment up to within 1 cm. of the edge. Since this has been done the irritation complained of in some of the early cases has been, to a large extent, eliminated.

The ointment may be applied over the whole surface of the wound if it be small, or simply to the growing epithelial edges. Whichever method is chosen it is best to apply the ointment on perforated old linen, to which the granulations will not adhere, and which allows the escape of secretions and thus prevents maceration. When applied to the edges, the old linen should be used in narrow strips covered with a thin layer of the ointment. I prefer the old linen to the rubber protective advocated by Cernezzi, as it is less macerating.

Another very satisfactory method is to apply a thin coating of the scarlet red ointment to the wound edges with a camel's hair brush, being sure that the edges are dry. Then either cover with strips of old linen, or expose to the air. This is especially useful in the partial graft cases, and on small wounds, as the ointment can thus be accurately placed, and the amount regulated.

The portions of the wound not covered by scarlet red may be dressed as seems best, or may simply be exposed to the air under a cage.

A light dressing of sterile gauze secured by a bandage completes the procedure. This dressing should be removed within 48 hours, 24-hour intervals being preferable, and replaced by some bland ointment, such as zinc or boric ointment. After the same interval has elapsed the scarlet red dressing should be replaced.

The importance of careful dressing is to be emphasized, as in some cases severe irritation has followed the improper application of the dressing.

It is well to warn patients that the ointment may stain the dressing red, as several have returned much frightened, saying that the wound had been bleeding.

Cases Treated.—There were 60 cases treated. Of these 44 were males and 16 females, the youngest being 2 years old, and the oldest 76 years. White, 46; colored, 14. Duration of the lesions, a few days to 15 years.

The cases were grouped as follows:

Partial skin grafts	7 cases.
Ulcer following operation for infection	10 "
Ulcer following burn	11 "
Traumatic ulcer	10 "
Specific ulcer	8 "
Varicose ulcer	7 "
Ulcer following Cotting operation for ingrown toe nail	3 "
Bedsore	2 "
Miscellaneous ulcer	2 "

The general health of the patient seems to have some bearing on the stimulating effect of the scarlet red, which is distinctly less marked in nephritic and diabetic cases. The age, on the other hand, has little or no effect; for instance the measured growth on one patient 76 years old was 3 mm. in 48 hours, and in another 67 years old, there was a growth of thick epithelium 4 mm. wide in 48 hours (Figs. 1 and 2). As we seldom have two lesions of exactly the same size on the same person, it is difficult to make an accurate comparison between the rapidity of healing of a wound treated with scarlet red and one treated with the ordinary methods. However, on one patient there was an ulcer 3.5 x 3 cm. on each

leg, and the one treated with scarlet red healed three weeks before the other, which was treated in the usual way. The difference in the appearance of the newly-healed area was very marked, that following the scarlet red being thick, firm, and so much like the normal skin that it was difficult to make out the original outline of the ulcer, while the usual sharply-defined scar marked the location of the other ulcer. In many cases there is undoubtedly a very marked stimulation of the epithelial growth, and while personal supervision in this series in connection with careful dressing is a factor which must be considered, taking the results as a whole, one would hardly feel justified in attributing the success of the treatment entirely to this supervision.

The rapid-growing epithelium is thick and at first a bluish-red with an opalescent spreading edge. Venules of considerable size can be seen close to the surface. The color and the enlarged vessels soon disappear, however, and the newly-formed tissue rapidly assumes the color and characteristics of the normal skin.

A section through an area thus healed shows practically normal skin. As a rule after a short time this skin becomes freely movable over the underlying tissues.

In several instances the patient did not return for from 5 to 16 days after dressing with scarlet red, and it was noted in two of these cases that where the granulations had been exuberant on small ulcers, a cone-shaped mass of epithelium covered these granulations. This projection soon disappeared, and the epithelium assumed the level of the surrounding skin. No apparent bad effect resulted from the prolonged exposure to scarlet red in these cases, except that a greyish membrane formed over the granulations, which could be stripped off, and the healthy granulations exposed. It is needless to say that there was no irritation in this group of cases. The greyish membrane over the portion of the granulations covered with scarlet red will often form within 48 hours, and can be easily lifted off.

The method of pigmentation of the newly-formed pink skin on negroes is interesting. Within a short time the sharply-defined edges of the normal skin become wavy, and streaks of pigment project from it (Fig. 3). Here and there in the pink skin isolated patches of pigment appear, some of which are several centimeters from the pigmented skin edge. This seems to show that the pigment is derived from the deeper tissues, as well as from the skin edge. The pigment spreads from these patches also, and the entire area becomes dusky, and later assumes the color of the neighboring skin.

The sensation of the newly-formed skin begins at the margins, and gradually spreads towards the centre. This is similar to what occurs in skin grafts, the nerve supply coming from the edges of the wound, and not from the underlying tissues.

On those wounds which heal and then break down, because of the unstable condition of the epithelium, scarlet red has been useful; for example, a superficial ulcer following a burn on the front of the ankle and entire dorsum of the foot, had nearly healed several times, and then completely broken down again. Treatment with scarlet red ointment was begun on December 26, 1908, and the healing was complete and all dressings were omitted on January 8, 1909, since which time the patient has had no further trouble, as the wound is covered with thick stable epithelium.

Scarlet red should not be used on burns until the irritation has disappeared, and the granulations are well established.

The exact strength and combination of the ointment to be used on different types of wounds can hardly be dogmatically stated, as experience is necessary for this knowledge. However, a few general observations may be of advantage. The 8 per cent ointment is used unless especially contraindicated. In some cases which were sluggish to the 8, the 20 per cent ointment has caused rapid stimulation of the edges. I should not advise the constant use of the 20 per cent strength, as on several occasions it has proved too irritating in spite of all precautions. It is of value now and then, although its action should be carefully watched.

On several wounds which were nearly closed, the pure scarlet red powder was dusted on the uncovered area, after protecting the surrounding skin. It had a marked drying effect and caused no irritation.

When the wounds are covered with unhealthy granulations, and the discharge is profuse and foul smelling, I have found the scarlet red in iodoform ointment, or balsam of Peru, or blue ointment very efficacious in cleaning up the granulations, and at the same time stimulating the epithelial growth.

As an example of the unfavorable type of wounds treated, I will mention an extensive multiple leg ulcer of five years' standing, which was covered with maggots when the rags with which it was wrapped were removed. This was cleaned up and dressed with scarlet red, and within 48 hours there was a definite stimulation of the epithelial edges, and uneventful healing later. It is interesting that this patient came to the Dispensary because he had mashed the tip of his little finger, and not for the leg condition, which he had been taking care of at home.

A number of large specific ulcers having a duration of from three months to five years, which had not responded to constitutional or local treatment, were stimulated markedly by scarlet red. Although they were among the most unfavorable looking ulcers, the healing was prompt and lasting. In the specific cases constitutional treatment was of course continued. Several of these ulcers were very sensitive, and the patients volunteered the statement when returning for dressing that the "red salve" gave them more comfort than any dressing they had ever had. This seems a curious fact, inasmuch as scarlet red had an irritating action on some other cases, and caused pain and discomfort. Scarlet red in blue ointment is especially useful in treating specific ulcers.

There is a difference in the degree of stimulation caused by scarlet red on the epithelial edges of the same wound at different times. I have also noted that in several cases one portion of the growing edge was markedly stimulated, while the remaining portions were only moderately so (Fig. 4).

The skin formed under scarlet red seems to fill the place of the missing skin, somewhat like a whole thickness graft, and in only one case has there been any tendency towards cicatricial contraction. This case, a burn of the neck and chest, was treated in the hospital by the usual methods for some time before scarlet red was started. Several weeks after healing the patient returned with a small contracted band of scar tissue on the left side of the neck. She was advised massage, and told to return if the condition continued.

Several varicose ulcers were treated with scarlet red without a pressure bandage, in order to test the efficacy of the healing, and there was no diminution noted in its rapidity or character.

Ulcers following the Cotting operation for ingrown toe nail are usually sluggish, and heal slowly, but with scarlet red the healing is materially hastened.

In an ulcer following the excision of an epithelioma of the face, there was a recurrence in the lower angle of the wound three weeks after operation. The ulcer had been treated once with scarlet red, only two days before the recurrence was noted, so I do not consider that the scarlet red was in any way responsible for the recurrence (Fig. 5).

I have been able to try the effect of scarlet red on autodermic and isodermic partial Thiersch and whole thickness grafts, and also on zoödermic (dog) grafts. All of the seven cases which were grafted had very extensive lesions, and several partial grafts were placed on each of these at different times. The wound edges and also the edges of all these types of grafts were markedly stimulated. Scarlet red, 8 per cent, if applied to the surface of a Thiersch graft within four days after transplantation, causes maceration of the surface. In order to avoid this I find it advisable to apply the scarlet red in from 4 to 8 per cent strength to the edges of the graft alone, and not until 10 days have elapsed. Only the edges of whole thickness grafts should be covered with scarlet red, unless the superficial layers are cast off, in which case the whole surface of the graft should be covered, as it will hasten the "topping" of the graft with epithelium.

Wolfrum and Cords report favorable results with 5 per cent scarlet red ointment on corneal ulcers.

My experience with scarlet red on mucous membranes has been confined to pieces of vaginal mucosa transplanted on to granulating wounds. The edges of these grafts were stimulated, and also the defect left by the removal of sections for examination healed under scarlet red very rapidly. From the above experience I have no doubt but that this method of treatment can be utilized with advantage on mucous membranes, which can be kept reasonably dry.

It is an interesting fact that the scarlet red is absorbed and then excreted by the kidneys. This has been noted in a number of cases: for example, a large ulcer of the chest, following a burn, was dressed with scarlet red, 8 per cent, at 1.30 p. m., December 13, 1908. The urine voided at 2.10 p. m. was clear amber; at the next voiding at 9.30 p. m. it was a bright scarlet. December 14, at 2 a. m., still a bright scarlet; at 8.10 a. m. it was a pale red; at 11.25 a. m. still a pale red; at 1.30 p. m. the scarlet red was removed and the wound was dressed and irrigated. At 2.15 p. m. the urine was a reddish amber; and so on until 8.30 a. m., December 15, when it was a pale pinkish color; after this the urine resumed its normal amber color. There is no undue stimulation of urinary secretion, and except for the color, the constituents of the urine are unchanged. The other excretions were apparently unaffected.

There was severe irritation in 10 cases, 8 of which were not permanently helped by the treatment, although there was stimulation of the epithelial growth in all but two cases. Most of these cases were those treated early in the series, and since better technic has been employed, no severe irritation has occurred. However, in 16 other cases there was a slight reddening of the surrounding skin accompanied by a burning sensation at some time during the treatment, although this in no way interfered with the ultimate result.

In several instances scarlet red had to be discontinued on account of the pain and irritation caused by it. This was especially noticeable in women and young children.

In the case of a child two years old, with an ulcer following a burn of the axilla, the irritation of 5 per cent scarlet red ointment was very marked. Following a second application of the ointment there was a sharp attack of erysipelas. Cultures from the ointment were negative, and as there had been no case of erysipelas in the hospital for some time it is likely that the irritation produced a favorable condition for the infection.

In a case of varicose ulcer of which the duration was 10 years, and where the skin was particularly sensitive to scarlet red, there was a definite phlebitis of several veins in the neighborhood of the ulcer, after the third dressing with scarlet red, and it seems probable that the irritation caused by the scarlet red might have extended into some of the superficial varicose veins. This patient became very ill, and was admitted to the hospital. He ran a high temperature for about 10 days, which was suspected to be due to typhoid infection, but this was not proved, and about three weeks later he was discharged from the hospital, the phlebitis having cleared up perfectly.

In a tuberculous ulcer of the groin of eight months' duration, measuring 8 x 10 cm., and having undermined edges, scarlet red was tried and very markedly stimulated the epithelial growth. It was quite remarkable that the new thick epithelium started beneath the undermined edges, and for a time these edges overlapped the new epithelium slightly, but were finally absorbed. This ulcer healed rapidly with firm healthy skin until 1.5 x 2.5 cm. remained uncovered, then suddenly without any apparent cause the ulceration began again here and there on the edges and in the new skin. On the continuance of the same treatment the ulcer finally healed completely, and as yet shows no tendency to break down.

Where tight pressure bandages are applied over scarlet red, there is more likelihood of irritation. There have been several cases in which there was marked stimulation of the epithelial edges at the beginning of the treatment, but later just as marked deterioration. This was the case especially when the

attendance of the patient was irregular, and in such instances the treatment with scarlet red was discontinued.

In one case where a patient with a varicose ulcer stayed away from the Dispensary for five days with the scarlet red dressing, the irritation of the surrounding skin was so intense that a break-down was feared. This fortunately did not occur.

The skin over old scar tissue is apparently much more easily irritated than normal skin.

The stability, thickness, and normal appearance of the healing under scarlet red is noteworthy, and even if the healing in some few instances is no more rapid than that under the ordinary methods, these advantages would seem to make it worth while (Figs. 6, 7, 8, 9, 10).

NOTES.—The effect of Soudan III on the epithelization of granulating wounds is now being tried, and the results will be reported later.

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THE DISPOSAL OF THE WASTE OF THE BRAIN TISSUES.

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Unlike other organs of the body, the tissues of the encephalon are devoid of the ordinary system of lymphatics, using the word lymphatic in the same sense as we do in the emunctories of gland or muscle, and a newly-arranged apparatus now subserves these functions. Within the brain substance, one finds two varied apparatus that supplement each other, and serve to carry off the used-up products of cell metabolism, as well as the effete serum that has percolated through the walls of the capillaries into the surrounding tissues.

As stated, the system consists of two essential parts, which together form an unit. One division may be described as having a passive function, the spaces that surround the blood-vessels, both veins and arteries, hence are known as the peri- or extra-vascular spaces, or channels, which act as the collecting sewers for the general system; and secondly, an apparatus consisting of complicated neuroglia cells, with fleshy bodies, from which extend channeled feet into the periphery of the perivascular spaces acting as important collateral drains to the general sewage system.

A third though very subsidiary apparatus should be included in the general system, belonging to the sheaths of the blood-vessels and not to the nervous substance, and lying between the muscularis and adventitia of the vessels' walls,—the so-called Virchow-Robin lymph space. This carries effete plasma only from the elements of the blood-vessels' walls, and from nowhere else, and is of minor importance to the nerve tissues.

The active drainage apparatus, the footed or podasteroid cells, are found in myriads in the cephalic substance along the blood-vessels, as well as at more distant points. They are more clearly brought out, as well as differentiated, by the silver than by other stains. In a section of the cortex of the brain, so treated, they show a fleshy body, coarsely arborescent branchings, and a thicker foot attached within the margin of the perivascular space. These cells take up and pass on into the His lymph space substances, both fluid and solid, which are no longer of service to the tissue economy.

How do we know that this latter statement is true? Because after a cerebral hemorrhage these cells are found to be filled with the detritus of red-blood corpuscles; after a severe toxæmia, as for instance, following acute alcoholism or ricin poisoning, they are seen to be swollen and degenerating.

The function of the brain, as an organ of mind, is directly dependent upon their efficiency. If they lose their functional activity there is a consequent retention in the tissues of catabolic residue, a part of which, the altered albumens, must be exceedingly deleterious to the life of the nerve elements, and as a result of this imperfect metabolism we are unable to think clearly, or if the condition continues there is inhibition of the intellectual processes to their complete extinction.

The deeper lying podasteroid elements are assisted to some extent by certain other neuroglia elements having the same function. These are situated just beneath the peridyme of the brain rind, and have a wedge-shaped body with numerous thin hair-like extensions radiating centrally, very much like the brush of a horse's tail, and from this likeness are called the horse-tail cells. Toward the periphery they throw out shorter and thicker branches terminating in an end-knob lying on the free surface of the cortex, among the felted network of neuroglia fibres that at this place forms the outermost covering of the brain rind.

Through these clubbed feet the excreted lymph is thrown directly into the epicerebral space, to be carried off in a manner to be described later.

The part of the sewers, through which the lymph drains from the various tissues to eventually pass to the neck lym-

phatics, is subserved by the pericellular and perivascular spaces. In a section of the cortical substance—preferably from the brain of a new-born child—one may see, surrounding each pyramidal cell, a free space which extends up and down for some small distance on the stems of the apical and basal processes. The cell body is therefore separated and surrounded at all times by a fluid which, to an extent, isolates it from the adjacent tissues. By a careful search one may further determine that from each of the perivascular sacs a fine channel extends to the lymph space surrounding a neighboring blood-vessel, and that the contents of the sac may discharge into the perivascular space at any time, either by increased pressure from behind or by capillary attraction. Furthermore, it is possible, in early life, to inject these pericellular spaces with colored fluids from the perivascular space of one of the larger blood-vessels.

The pericellular sacs appear to be the end stations—the cloaca so to speak—of the perivascular canal apparatus, into which the devitalized serum as well as the waste tissue products directly drain from the larger nerve-cell bodies.

For the many smaller elements, nerve or neuroglia, as the case may be, the other apparatus—the channeled podasteroid glia elements—appears to suffice.

Let us turn back for a moment to consider the structure of the cerebral blood-vessels and their adnexa. On looking at a section of the cortex from a young child, and selecting one of the arteries of considerable size, it is immediately recognized that the arrangement of the vessel with reference to the adjacent tissues is different from that of any other portion of the body, and that the adventitia of the vessel is not in intimate contact with the surrounding tissues, but hangs freely in a space—the so-called lymph space of His, or perivascular space—which now affords a complete drainage apparatus for the lymph.

Internal to the adventitia another split or space is seen—the intra-adventitial or Virchow-Robin lymph space—which serves to carry off the used nutrient fluids from the middle sheath of the blood-vessel itself.

On further examining the section we will discover that the points of discharge of these lymph canals are quite different from those of the His space, the Virchow-Robin following the course of the blood-vessel into the vascular layer of the pia, and there discharging into the lymph lacunæ of this membrane, while with the perivascular channel the discharge is directly upon the epicerebral surface, to eventually find its way through the lymph splits of Arnold into the general system of lymphatics of the pial membrane.

After passing into the wide lacunæ of the soft covering of the cortex, which are very numerous, the lymph eventually finds its way through foramina at the base of the skull into the deep cervical lymphatics, thence into the lymphatics of the thorax.

In a very minor degree the meningo-ventricular serous cavities may also be considered as having some excretory function. From the almost completely closed character of these spaces in man, it must amount to very little, while in such an animal as amphioxus it may be very considerable, for in the latter instance water is taken up through the infundibular opening, passed through the equivalent of the ventricles, through the canal of the spinal cord, eventually out through the blastopore, carrying with it any effete substances. The sub-dural space is covered, like the ventricular surfaces, with flattened epithelial cells, and one communicates with the other through openings in the pia mater on the lower portion of the floor of the fourth ventricle.

To recapitulate: The main channels or excretory sewers of the brain substance are subserved by the His lymph spaces of the blood-vessels, which empty upon the peridyme of the cerebral cortex, and their beginning is in the sacs surrounding the larger nerve cells, particularly those of the second and third layer of the cortex. The function of this portion of the excretory system is mainly a passive one.

Adjunct to the actual sewers, we find an apparatus consisting of peculiar neuroglia cells with terminal channeled feet inserted into the perivascular space walls, into which it throws fluid or granular material from the breaking down of cellular elements—nerve or blood cells as the case may be—to eventually find its way through the common excretory sewer to the cortical surface. The function of these channeled neuroglia cells must be an active one, for the reason that after hemorrhages within the brain substance they are found filled with hematoidin granules from the disintegrating red-blood cells.

POST-ANÆSTHETIC ACIDOSIS.

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General anæsthesia is occasionally followed by untoward effects many hours after the narcosis itself. Since the pioneer paper, by Casper (1), many authors have reported instances of serious and fatal post-anæsthetic intoxication, more commonly following chloroform, but observed also after ether (Guthrie (2), Brewer (3), Brackett, Stone and Low (4), Bevan and Favill (5), Carmichael and Beattie (6)). Ethyl-chloride, too, has given rise to a post-operative acidosis (Cunningham (7)). In the study of this condition, other investigators have made routine analyses of the urine of patients before and after anæsthesia, testing for acetone and diacetic acid as the indicators of an acidosis (Becker (8), Kelly (9), Hubbard (10)). It seems certain that after surgical anæsthesia one not infrequently meets with an acid intoxication,

as evidenced by the appearance of acetone, and less often of diacetic acid, in the urine. This intoxication may be so slight as to give rise to no clinical symptoms at all or may be so severe as to cause the speedy death of the individual. The moderate cases are recognizable clinically only by the somewhat prolonged post-anæsthetic nausea and vomiting. The severe cases, fortunately rare, present the following symptom-complex. The patient recovers from the anæsthetic quite normally, and seems to be doing well for from 18 to 72 hours. Then nausea and vomiting set in, followed by great prostration, rapid pulse and drowsiness. The breath has a fruity odor and acetone and diacetic acid in large amounts are found in the urine. There is usually no fever. The stupor is interrupted by an active delirium, which is in turn followed by coma, and the patient dies without regaining consciousness. At autopsy, the most striking and constant finding has been fatty infiltration of the liver.

Concerning the cause of post-anæsthetic acidosis there is no general agreement. Indeed, its very existence has been doubted. Hewitt (11) states that he has not seen a single unquestionable case in 20 years' practice. Four hypotheses have been advanced to explain the condition. (I) Carmichael and Beattie ascribed the fatal result in their case to "idiosyncrasy." (II) Lorenz (12) has shown that gastro-intestinal disturbances may, in themselves, be responsible for the appearance of an acetonuria. It is by no means unthinkable that the well-known gastric upset following general anæsthesia may be, in some cases at least, the cause of the urinary findings. (III) As Guthrie judiciously remarks, the small amounts of anæsthetics used could not be held at fault for the untoward later course, and the essential etiological factor may be some pre-existing metabolic fault, possibly associated with fatty changes in the liver. (IV) Kelly believes that nervous influences play an important causative rôle in the production of the symptom-complex, "a toxic substance acting on the psycho-motor centers." Brackett, Stone and Low also lay great stress upon a neurotic element.

My especial attention was brought to the subject by a case under my charge, whose history was briefly this: Injured in a trolley wreck, a boy of eighteen was brought to the clinic with extensive lacerations of his left leg and a simple fracture of the femur. Under ether anæsthesia a reparative operation was done, which lasted about three-quarters of an hour. Recovery from the narcosis was quite normal. On the next day, however, the patient became nauseated, restless and rather irrational. His pulse was 120, of rather poor volume and low tension, temperature 99° F. On examination of the urine a large amount of acetone with a strong trace of diacetic acid was found. He was given normal salt solution subcutaneously and per rectum. Sodium bicarbonate was added to the rectal salt solution and large doses of this alkali were administered by mouth. In 24 hours his symptoms had disappeared and with them the acetone and diacetic acid from his urine. At the suggestion of Dr. R. T. Miller, Jr., then resident surgeon, I began making routine examinations of the urine of patients under my charge. The urine was examined on admission, and again on the first, third and fifth days after operation. Legal's (13) well-known test was used for the detection of acetone, and Gerhardt's ferric chloride test for diacetic acid. No attempt at selection of cases was made. The operative procedures included varied from incision and drainage of abscesses requiring but a few moments to dissections of two hours' duration. The anæsthetics used were ether, chloroform, nitrous oxide or cocaine (1-1000 and 1-3000 dilutions). The duration of post-operative nausea and vomiting and the length of time the patient was starved were also noted. The object of the research was to get some idea of the proportion of cases showing a post-operative acidosis and to determine, if possible, the cause of its appearance. I was able in a few cases to obtain the urine of surgical cases who had undergone 24 hours' starvation previous to operation; the results of analyses of their urine are included in the table given below.

Sixty-nine patients showed no acetone or diacetic acid in their urine before being operated upon.

The following table shows the condition of the urine of these patients after the operation:

	Ether.	Chloroform.	Nitrous oxide.	Cocaine.	24 hours' starvation.
No acetone. No diacetic acid	20	4	5	2	3
Acetone present. No diacetic acid	14	1	2	4	2
Both acetone and diacetic acid present	8	1	2	1	0

Three cases had definite acetonuria on admission. All three of these showed marked increase in the amount of acetone, and also the appearance of diacetic acid in the urine after operation. Both of the cases who had an acetonuria after 24 hours' starvation were tremendously upset and nervous over the operation they were about to undergo, and both showed marked increase in the amount of acetone immediately after narcosis. The acidosis was found after chloroform, ether, nitrous oxide, and cocaine. There was no certain relation between the variety or amount of anæsthetic, or the length or character of the operative procedure, and the amount of acetone and diacetic acid found in the urine after operation. Much nausea and vomiting were observed with but little acidosis, and a few patients with very considerable amounts of acetone scarcely vomited at all. Those individuals who were most worried and depressed before operation seemed most likely to have an aciduria afterwards.

Acetonuria is perhaps much more common than is generally recognized. Kelly enumerates sixteen conditions in which it has been found; viz., diabetes, starvation, malignant tumors, digestive disturbances, septic processes, infectious fevers, pregnancy associated with a dead fœtus, psychoses, autointoxications, chronic morphinism, phosphorus poisoning, following general anæsthesia, in cerebro-spinal injuries, shock due to injury, fatty liver, and uræmia (?) (a fairly

comprehensive list). Beesley (14) differentiates, from a prognostic point of view, between an acute and a chronic acetonuria.

A phenomenon observed after four different anæsthetics in a certain proportion of cases could scarcely be called an "idiosyncrasy." It seemed to me that the lack of relation between the duration of starvation and the amount of acetone found made it rather unlikely that loss of food or digestive disturbances were responsible for the condition. Surely the anæsthetic itself is not to blame, for an acidosis is found after four very different narcotics. There must be some metabolic disturbance accompanying or possibly preceding the surgical operation. The nervous element seemed the most constant in relation to the acidosis.

Conclusions:

(1) Surgical anæsthesia is followed in a certain proportion of all cases by an acidosis recognizable clinically by the presence of acetone and (less often) of diacetic acid in the urine.

(2) The character and amount of anæsthetic used and the duration and character of the operation are of little, if any, importance in determining the appearance of a subsequent acidosis.

(3) Starvation and digestive disturbance are not accountable for the condition.

(4) Emotional individuals are more prone to a post-operative acidosis than the more phlegmatic.

I wish to express my indebtedness to Dr. W. S. Halsted for permission to report these cases, and to Dr. Miller for suggestions and help.

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PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

February 15, 1909.

Meeting of the Johns Hopkins Hospital Medical Society. Dr. Frank R. Smith, the president, in the chair.

I. The Electron and Some of Its Applications. DR. HARRY C. JONES.

Dr. Jones gave a very scientific description of Thomson's theory of the electron and its justification. The deductions, based upon what Dr. Jones calls one of the most brilliant experiments the world has ever seen, show that there is a particle called the *corpuscle* split off from any gas when an electrical discharge is passed through it. This corpuscle has about 1/800 the mass of the hydrogen atom, carries one unit of electricity, and is the same regardless of the nature of the gas from which it is split off.

The line of reasoning was then sketched which led Thomson to conclude that the "corpuscle" contains no matter at all—nothing but the electrical charge. Electrical charges moving rapidly through a perfectly elastic medium such as ether have both mass and inertia; and Thomson showed that all of the mass and inertia possessed by the corpuscle can be accounted for by the electrical charge alone. This charge he termed the "*electron.*"

From the work of Thomson and others all matter is probably made up of positive and negative electrons, the electrical counterparts of each other.

The application of the electron conception was made in several directions. The ordinary definition of the chemical atom laid stress upon its indivisibility. But now it is highly probable that the atom of hydrogen, for instance, is composed of at least 800 electrons distributed in some way throughout the atom. The exact distribution in three dimensions was too difficult a problem for even Thomson to solve. Thomson, however, did show the arrangement of the electrons is such that the interelectronic spaces bear approximately the same relation to the spaces occupied by the electrons, as the interplanetary to the planet spaces. The atom is then an extremely complex system, each constituent moving with a definite velocity and in its own orbit.

The application of the electron theory in explaining the dissociation of a salt by water is very simple. One or more negative electrons is transferred from the positive to the negative constituent, and the former is thus left positive, the latter becomes negative.

Chemical valence is also readily dealt with by the electron theory. A univalent positive element carries one more positive electron than negative, a bivalent two more positive electrons, and so on. If the negative are in excess by one electron, negative univalence results. This definition of valence has a rigid, physical basis.

Matter is known to contain "energy" in some form, since energy can be obtained from it; for example, heat from the carbon atom. From the electron theory, the atoms making up matter are composed of great numbers of electrons moving with high velocities. The kinetic energy of these moving

electrons is necessarily very large. The transformation of a part of this energy into heat, light, or electricity enables us to explain physically the sources of these forms of energy, which has hitherto been referred rather vaguely to intrinsic energy. The electron theory enables us to interpret the fact that radium will give out enough heat to melt its own weight of ice every hour during its entire life, which is between 2000 and 3000 years. This is several million times the amount of heat liberated in the most exothermic chemical reaction. This tremendous amount of energy must come ultimately from the kinetic energy of the electrons within the radium atom. If we regard the atom, as formerly, as an ultimate unit, then we can form no physical conception of what intrinsic energy really means.

II. Hemiplegias of the First Decade. Dr. Henry M. Thomas.

Dr. Thomas reported an analysis of the hemiplegias of the first decade of life occurring in the neurological dispensary and the medical clinic of the hospital; 132 cases in all were divided as follows:

Congenital	36
In acute epidemic diseases	28
In undetermined illnesses	15
From other definite causes	20
Associated with convulsions	24
Developing without given cause	9

The majority of the congenital cases in this series were due to the accidents of labor. Hemorrhages during labor are not uncommon, every baby, as a rule, suffering some small hemorrhages. Howe has found retinal hemorrhages in a large proportion of the newborn—as much as 20 per cent after normal labor, and 50 per cent in the cases of contracted pelvis. Hemorrhages about the upper spinal cord are attributed to premature labor and asphyxia by Little. Of 959 cases dying at birth or in the first year Weyhe found 122 with intracranial hemorrhages. Prenatal encephalitis, described by Virchow, has not been confirmed by later observers. Intracerebral hemorrhage does occur in the fœtus, and accounts for some of the congenital cases. One autopsy record of Dr. Thomas' and three in the literature were of cases of cerebral hemorrhage in fœtuses found postmortem in utero.

In acute infectious diseases it is due to hemorrhage, thrombosis, embolism, or encephalitis. The cases were divided as follows:

Whooping cough	7
Typhoid fever	5
Measles	5
Diphtheria	4
Tonsillitis	1
Gastro-enteritis	3
Marasmus	1
Pneumonia	1
Croup	1
Congenital syphilis	4

In whooping cough it is due to hemorrhages from venous congestion. Smithies reports nine cases in typhoid fever, due to thrombosis. In measles it is a thrombosis or encephalitis according to Struempell.

The undetermined acute illnesses usually amounted to fever and convulsions followed by the hemiplegia. It is probably an encephalitis analogous to poliomylitis of the cord.

Twenty-four cases were associated with convulsions without fever, the paralysis occurring after the convulsions had ceased. The hemiplegia is possible from hemorrhage due to the convulsion itself.

Finally, without any cause, such as a heart lesion, hemiplegia has occurred like a bolt out of a clear sky, developing just as the apoplexy of old age. One case has occurred in each year of life from one to nine.

March 1, 1909.

Meeting of the Johns Hopkins Hospital Medical Society. Dr. Frank R. Smith, the president, in the chair.

I. Intestinal Obstruction: An Anatomical Study. Dr. J. W. Draper Maury, New York.

During the past four years, something over 400 experimentally-produced intestinal obstructions had been made and studied at the Surgical Research Laboratory of Columbia University. This was the largest series, so far reported, of obstructions occurring in the duodenum and jejunum. Of obstructions situated in the aboral portion of the jejunum, the ilium and colon, no mention was made because the studies had purposely been confined to so-called high intestinal obstruction.

All the experiments had been done in the same general way, namely, at time of the production of obstruction, a potential drainage had been arranged for by the making of a so-called twine triangular gastro-enterostomy. This control was used as a time unit in studying the different lethal outcomes of the experiments. A considerable sized series was used in determining that the presence or absence of food in the intestinal canal had nothing whatsoever to do with the cause of death. Other studies corroborated the findings made at the Johns Hopkins Hunterian Laboratory, and elsewhere, that death was not due to a bacterial invasion which had entered the body, as until now, there has been adequate and reasonable ground for supposing, through the devitalized intestinal wall oral to the obstruction. This, it should be remembered, referred exclusively to the obstruction situated in the region of the duodenum only. For one important point of the studies was that the death occurring in this region was of a quite different type from that which was to be dealt with when the ilium or lower bowel was obstructed.

It was noted that the smallest amount of drainage of the duct-bearing region of the duodenum would permit of life continuing during the triangular control; also that if the obstruction were situated 35 centimeters or more aboral to this region, the animals would live until drainage was established at the stoma.

The drainage of the bile was discussed with the conclusion

that it had little or nothing to do with death from intestinal obstruction.

The pancreatic secretion, however, appeared to play a rather important part in the lethal outcome, because in many cases it was noted that death would occur if the obstruction were placed just aboral to the pancreatic duct, whereas if placed just oral to it, dogs would usually live throughout the stoma control. In like manner, the supposed toxic secretions of the stomach were shown not to be so important a lethal factor as had been supposed by some observers, because of the fact that complete pyloric stenosis was in no way so fatal as was obstruction occurring within the 35 centimeter limit and situated aboral to the pancreatic duct.

The speaker suggested that these observations might be interpreted as showing the nature of the cause of death in high intestinal obstruction to be a physiological rather than a pathological one, and that the source of the lethal material was the duct-bearing portion of the duodenum. He further pointed out that the studies indicated a very close physiological balance between the duodenum, the stomach, the pancreas and the liver. The morphological relationship of these parts had been graphically portrayed by Mumford, who said that this portion of the intestine resembled a stem having three apples pendant from it.

The final conclusion of the studies was that death in duodenal obstruction might be due to a disturbance of the intra-enteric balance between enzyme and unknown anti-bodies. It was not due in the slightest degree to the local or remote injury resulting mechanically from the obstruction. It was not, in the portion of the intestine referred to, due to the action of bacteria or their products, and, finally, the presence of decomposing food played no part whatsoever in the process.

The therapeutic deductions were left in the hands of the clinical surgeon.

Discussion.

DR. WELCH.—This paper illustrates the interesting and valuable results which are coming to physiology and pathology from the surgeons. This extremely complex and difficult subject is being enriched by their contributions of even routine work.

The effects of obstruction at different levels are interesting. The death from obstruction below 35 cm. is not the same as that higher up. The pancreatic juice plays a rôle in this kind of death, although Opie's work has shown that death is not due to tying off of the pancreatic ducts. The part of the intestine in which bile and the pancreatic juice is poured is a kind of organ with a delicate balance in enzyme production. The symptoms are due to intoxication, not infection. It may be due to an upset of the balance of the enzymes so nicely adjusted in this portion of the intestine. As to the attempts to isolate the toxin, that may be impossible even when continued absorption proves toxic.

We are very fortunate in having this presentation here!

DR. FINNEY.—An admirable presentation! It is an interesting question to surgeons who are constantly meeting with these clinical problems. Familiar questions arise.

It is not difficult to diagnose and localize obstruction as a rule. Immediate and more pronounced symptoms occur if the obstruction is high up. The mortality is greater. Dr. Maury has suggested the explanation. Obstruction to the circulation is always found. Murphy shows the condition is more serious in the event of venous than of arterial obstruction. Has Dr. Maury taken this into account?

Ten years ago, first, I noticed a very well-marked dilatation of the duodenum with thinning of the wall. Simple mechanical obstruction to the lumen does not explain this. I have never found a satisfactory explanation.

DR. BLOODGOOD.—This sort of work has great importance in the advance of surgery. Such work as this, first, has shown that death in hemorrhagic pancreatitis is due to trypsin. It was formerly accredited to shock. The importance is seen in the indications for operation, formerly thought to be contraindicated on account of the shock.

The mortality, secondly, in intestinal obstruction is high. Clinically, obstruction at the ileocæcal valve causes death in seven to ten days; higher up, in four to five days. Most important is evacuation of the distended portion of the intestine, and the higher up, the more necessary even in early operations. The question arising is the technique of this evacuation. Maury has mentioned washing out. It should be emphasized.

Thirdly, are we not all long-looped dogs? and the cases of high intestinal obstruction short-looped dogs? Watts has shown the efficacy of transfusion. So we would recommend: (1) Washing out through the stomach; (2) direct transfusion of blood.

DR. MAURY.—I have already referred to an operation where the ileum was cut near the ileocæcal valve and the end anastomosed to the stomach. These animals live from two to three weeks without many signs of intoxication or shock. They are evidence of the elimination of shock.

I have not done any experimental work with the introduction of the contents of short-looped bowels into another dog. And I have no specific observations upon the dilatation of the duodenum. Death is too rapid for a mechanical dilatation. It seems as if it were a relaxation of the duodenal wall.

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NOTES ON NEW BOOKS.

On Infantilism from Chronic Intestinal Infection. By C. A. Herter, M. D. Price, 90 cents. (*New York: The Macmillan Company, 1908.*)

In recent years, during which such remarkable discoveries have been made concerning the far-reaching influence of the organs of internal secretion upon metabolism and growth, there has been a tendency to regard all disturbances of growth and general metabolism as due to the derangement at some point or other of this important group of organs. Dr. Herter adopts a quite different line of investigation, however, in attempting to establish the nature of those cases in children in which, with practical cessation of growth, he finds evidences of intoxication and abnormal intestinal infection. The cases of so-called infantilism are peculiar inasmuch as the bacteria found in the intestine are those which are characteristic of the nursling period. Gram-positive microorganisms, especially the groups *B. bifidus* and *B. infantilis*, predominate, and the putrefactive processes associated with the presence of such organisms produce such substances as indican and phenol compounds, which are doubtless absorbed and give rise to the symptoms of intoxication which occur. Digestion and absorption of fats are greatly impaired, fatty acids, neutral fat and soaps appearing in the stools, and in consequence of this abundant excretion of such soaps as are formed with calcium, the necessary material for skeletal growth, is lost. Therapeutic measures, especially in the studied regulation of the diet to suit these conditions, frequently give the best results. Errors are, however, followed by relapses, in which the infantile bacterial flora, which practically disappears in the period of improvement, returns as before.

The evidence which Dr. Herter brings forward in favor of the bacterial or infectious nature of the whole process is strong, but perhaps not quite conclusive, for the disturbances of digestion and absorption might perhaps be conceived of as affording a favorable basis for the growth of such bacteria. The book is written, however, in such a way as to impress one with the great care with which the work has been carried out, and to make it difficult not to accept all the conclusions.

Progressive Medicine. Vol. I. March, 1909. (*Philadelphia and New York: Lea & Febiger.*)

Frazier, Preble, Crandall, Kyle and Duel are the respective authors of the chapters on: (1) The Surgery of the Head, Neck and Thorax; (2) Infectious Diseases, including Acute Rheumatism, Influenza and Croupous Pneumonia; (3) The Diseases of Children; (4) Rhinology and Laryngology, and (5) Otology. This quarterly publication has now been appearing for many years, and it is much appreciated by the profession, as it saves the general practitioner much reading in the journals. It gives him in compact form the opinions of the leading men of the world on the most important questions in medicine.

Epoch-making Contributions to Medicine, Surgery and the Allied Sciences. Being Reprints of those Communications which First Conveyed Epoch-making Observations to the Scientific World, Together with Biographical Sketches of the Observers. Collected by C. N. B. Camac, A. B., M. D. With portraits. Price, $4. (*Philadelphia and London: W. B. Saunders Company, 1909.*)

Dr. Camac has here done an admirable piece of work, which will be received with gratitude by every true student of medicine. This collection of contributions is one with which we should all be familiar. Without a knowledge of the great discoveries in medicine one cannot have a true appreciation of its growth and development, and this knowledge could not previously be had by many of us, who either did not read foreign languages or were without access to the necessary books. With this book on our shelves one can at once turn to the original papers by Lister, Harvey, Auenbrugger, Laennec, Jenner, Holmes and the group of Morton, Wells and Warren, with whose names the discovery of anæsthesia is connected, and Simpson, the first user of chloroform as a narcotic. The book is and will ever be a source of infinite inspiration to the imaginative student, and, above all, should he be impressed by the modesty and simplicity of these great men.

New and Non-official Remedies, 1909. Containing Descriptions of the Articles which have been Accepted by the Council on Pharmacy and Chemistry of the American Medical Association, Prior to Jan. 1, 1909. Price, cloth, 50 cents; paper, 25 cents. (*Chicago: Press of American Medical Association, 1909.*)

The thanks of all practitioners will go to the Council for this most useful manual, which is sold at such a moderate price that any doctor can afford it. The title of the work is its best description; and needs but little amplification. Under the name of each remedy is found its definition, its mode of preparation, its actions and uses and its dosage. As many of these remedies are in common use, this information is especially valuable, as it could not be found elsewhere without elaborate research. In issuing such a publication the Council stamps once again its great value to the entire medical profession, who may well be proud of the men who devote their time so generously to aiding the profession.

Third Scientific Report on the Investigations of the Imperial Cancer Research Fund. By Dr. E. F. Bashford. Price, 15s. (*London: Taylor & Francis, Red Lion Court, Fleet Street, E. C., 1908.*)

The First Scientific Report appeared in the spring of 1904 and the Second a year later. Thus the present volume represents the results of over three years' work carried on by a number of investigators under Dr. Bashford's supervision. Each observer has contributed a monograph, embodying the results of his special line of study, and these monographs, having been arranged in as logical a sequence as possible, are substantially bound in a single large octavo volume of 433 pages, which constitutes the Third Report.

The contributions fall naturally into two main groups, the first of which is much the smaller, and is concerned with matters of more general interest bearing on cancer, while the second forms the bulk of the report and details a variety of experimental cancer studies among small laboratory animals, especially white mice.

In the first group of papers very interesting and illuminating data have been collected, dealing with the ethnological and zoölogical distribution of cancer. The facts recorded seem to justify the conclusion of the authors that cancer is ubiquitous in man and vertebrate animals.

Special attention is given to the question of the incidence of cancer. Vital statistics are given, emphasizing its frequency, which alone furnish a humiliating record of the ravages of this disease, which has thus far stubbornly and successfully resisted every effort to control it. The authors wisely caution against drawing hasty conclusions from comparison of vital statistics of different countries until these statistics become much more accurate than at present. No reliable universal statistics are at present available, upon which one can base a conclusion as to whether or not cancer is increasing. The experimental study of cancer is

doing much, however, to remedy this state of affairs the world over.

The second group of papers records the results of a variety of laborious and painstaking researches on the malignant tumors of mice. Every paper is interesting and bears the stamp of accurate scientific study. The questions of hereditary influence; of resistance and immunity; of variations in growth-energy, or malignancy exhibited by a tumor carefully observed over a long period of time; the study of "early stages" to discover the factors at work in determining the fate of a graft; sarcomatous transformation in the course of carcinoma propagation; intimate histological study, often in serial section, of primary tumors and of metastases; the influence of surgical interference, and of various other factors on the growth of tumors; and finally, certain chemical and metabolic studies; are but a partial list of the problems receiving attention in this volume.

The frank publication of the laboratory technique and methods of recording tumor growth, with an earnest plea for the adoption of a universal system, is altogether commendable, and furnishes valuable aid to the inexperienced worker.

When it is recalled that this Report is based on a study of 70 propagable malignant tumors in mice, and that the inoculations in Bashford's laboratory now number high in the thousands, the views of these experienced workers on all of the important cancer questions so clearly set forth, are highly acceptable and of great value. They reiterate the views published in a former Report, that the infectious theory, the congenital theory and Ribbert's theory are all untenable and practically disproved in the light of present-day facts. They offer no substitute theory, but throughout the Report they attach noticeable importance to the relationship between chronic irritation and malignant new-growth.

The excellent work recorded in this volume leaves no doubt as to the value of the experimental study of cancer in animals. Dr. Bashford and his co-workers certainly deserve to be congratulated on this splendid contribution, a careful study of which impresses one no less with the vast amount of labor spent in its preparation than with the high excellence of the results obtained. It is of absorbing interest throughout, and leaves the reader in a state of healthy optimism as regards the future of cancer study.

The addition of a classified bibliography; of two appendices, one of which is a handy reference to all the previous publications from the laboratory, and the other a copy of the original scheme drafted by the committee as an outline for the research work of the laboratory; and further, of an excellent index; add materially to the worth of the volume.

The type is clear and attractive; and the numerous illustrations are exceptionally good, especially the microphotographs, which are well-nigh perfect. E. H. RICHARDSON.

Hay-Fever, Hay-Asthma—Its Causes, Diagnosis and Treatment. By WILLIAM LLOYD, Fellow of the Royal College of Surgeons; Surgeon in Charge of the Nose, Ear and Throat Department, Kensington General Hospital, etc. Second edition, 1908. (*London: Henry J. Glaisher; Chicago: W. T. Keener Company.*)

A remarkably valuable book on this little understood disease, subject to but one serious criticism—the last chapter should not have been written. As a clinical description of the affection it is perfect; by long odds the best ever given. Whether Dr. Lloyd is himself a victim of this strange malady does not clearly appear in the text, but I find it hard to believe anyone could so accurately depict the clinical symptoms, in its varying picture at different stages, unless he had experienced them. The brief historical review and the discourse on the cause of the disease are, likewise, very interesting. When it comes to the question of treatment, however, the author falls down badly. His reasoning on general plans of treatment is entirely sane, but his claims as to benefit to be derived from nasal operations are too broad to substantiate. We all acknowledge that where gross nasal lesions co-exist their removal may help, or even cure. We do not believe that ethmoiditis is the cause of the disease, nor that cauterization or slight operative treatments of almost insignificant nasal abnormalities will relieve or cure any considerable number of cases. The last chapter, therefore, which relates 26 cases, with all but one benefitted in this way, is too good to be true. H. O. R.

Blood Examination in Surgical Diagnosis. A Practical Study of its Scope and Technic. By IRA S. WILE, M. S., M. D. Price, $2. (*New York: Surgery Publishing Company, 1908.*)

This is an expensive primer, and as a primer for exact surgical diagnosis is insufficient. The drawings to illustrate the various forms of blood corpuscles are worthless, as they are not reproduced in colors, which is an absolute necessity for one who has made no previous study of the blood. The work cannot be recommended as of real value to any medical man, as there are so many much better books on the subject.

Bacterial Food Poisoning. A Concise Exposition of the Etiology, Bacteriology, Pathology, Symptomatology, Prophylaxis and Treatment of So-called Ptomaine Poisoning. By PROF. DR. A. DIEUDONNÉ, Munich. Translated and edited, with additions, by DR. CHARLES FREDERICK BOLDNAN, Bacteriologist, Department of Health, City of New York. Authorized translation. Price, $1. (*New York: E. B. Treat & Co., 1909.*)

After reading this small volume one feels that the exact knowledge of the cause of this form of poisoning is not yet well understood, and that it will require much investigation to elucidate this obscure problem. Dieudonné's treatise will help many a young student, in the course of his earlier clinical studies, and the translation seems to have been well done. It reads smoothly, and its publication may be welcomed.

A Manual of Bacteriology. By R. TANNER HEWLETT, M. D., F. R. C. P., Professor of General Pathology and Bacteriology, King's College, London. Third edition. (*London: J. and A. Churchill, 1908.*)

This work is well written, and has been brought up to date. It contains a surprisingly large amount of material in compact form. The chapters on the ordinary bacteriological procedures are satisfactory. The various types of immunity and the more important theories are well discussed. Probably too much importance is accredited to vaccine treatment, and especially to Wright's method of determining the opsonic index as a means of controlling it, though reference is made to criticisms of the method. The subject of anaphylaxis and serum disease receives but passing mention. The chapters dealing with the pathogenic organisms individually are quite complete, the protozoan parasites receiving attention as well as the bacteria.

The book is well printed and very well illustrated. On the whole it is a valuable work, and forms a distinct contribution to the subject.

Parcimony in Nutrition. By SIR JAMES CRICHTON-BROWNE, M. D., LL. D., F. R. S., etc. Price, 75 cents. (*London and New York: Funk & Wagnalls Company, 1909.*)

This small volume should be widely read, for it is a plea against the temporarily popular doctrine of Fletcher, that a very little food will suffice the average individual, if it be well-chewed. It is also a plea for a much more liberal diet than that declared by Chittenden as ample for maintaining a healthy condition of mind and body in persons leading ordinary lives, whether muscle or brain workers. To Fletcher's teachings the author pays but little attention—no more than they deserve—but to Chittenden's

work he gives serious consideration. After a careful marshalling of all facts known, however, Sir James Crichton-Browne remains strongly of the opinion that Chittenden has not proven his case, and that it would be a serious mistake for the world at large to accept his (Chittenden's) views, and diminish their diet by one-half or more, as the latter proposes. Sir James has written a most attractive essay, and the reviewer is of opinion that his views on nutrition are the sounder ones to follow.

Pulmonary Tuberculosis. By SHERMAN G. BONNEY, A. M., M. D. With 189 original illustrations, including 20 in colors and 60 X-ray photographs. Price, $7 net. (*Philadelphia: W. B. Saunders Company, 1908.*)

I am sure it will not be considered necessary for the reviewer to have read the whole of Dr. Bonney's book in order to write so modest a notice as this is. It is a formidable volume of 778 pages. I have read nearly the whole of Section I and parts of it with care; the chapters on the mode of onset, the symptoms and physical signs of disease and particularly the chapter on early diagnosis. Other portions of the volume I have glanced over, reading enough paragraphs here and there to get a general idea of their plan and contents. Dr. Bonney has written a good book, even though one may criticise many minor details and challenge numberless statements. The style lacks simplicity and inclines to be verbose and in places involved. Sentences similar to the following are not uncommon: "Behring's theory as to the transcendent importance of the infants milk as a carrier of infection, while unworthy of literal acceptance in its entirety, nevertheless is formulated upon certain fundamental truths and to a great extent, therefore, is entitled to a receptive consideration." There are errors of proportion. It seems to us that the Röntgen Rays are not of such unusual importance in diagnosis that their consideration deserves 42 pages of the book and 46 illustrations. Particularly not when tuberculin has but four. Although 24 pages are given over to an account of cases treated with vaccines there is only incidental mention of those methods of tuberculin administration which are most commonly used here and abroad. Out of 88 pages on the general treatment of pulmonary tuberculosis, 33 are used to extol climate, and particularly a special climate. Among many others the following statements would not meet with general endorsement. Speaking of percussion he writes: "In minutely comparing corresponding portions of the chest it should be borne in mind that at the apices front and back, and in the upper interscapular regions, there exists a normal disparity between the two sides, the right being slightly higher in pitch, less vesicular in quality and with diminished intensity."

"In view of a somewhat prevalent misconception regarding the relative value of the various physical signs, it may be asserted that comparatively slight importance attaches to inspection, palpitation or percussion in very early cases."

". . . . the product," speaking of tuberculin, "becomes inert after remaining diluted for more than forty-eight hours." And a few lines lower: "It is usually better to make the injections deeply into the muscles of the back rather than subcutaneously."

Speaking of the differential diagnosis, he quotes a case of recurring hemoptysis due to vicarious menstruation. He fails to state that many authors, and I believe even most, hesitate to admit that hemorrhage from healthy lungs ever occurs as a perverted function. It is well known that hemoptysis in some instances tends to recur at the menstrual period, but I have never seen such a case free from a strong suspicion of tuberculosis. The fact that the patient recovered is no argument against such a view. Certain chapters of the book are unusually well and even strikingly presented and display an intimate acquaintance with the best of tuberculosis literature. Such difficult questions as the relation of human and bovine tuberculosis and the paths of infection are treated with an accuracy and a discrimination scarcely to be expected from one not engaged in their actual solution.

X.

A Laboratory Guide for Histology. Laboratory Outlines for the Study of Histology and Microscopic Anatomy. By IRVING HARDESTY, A. B., Ph. D., etc., with a chapter on laboratory drawing by A. W. LEE, M. D. Two illustrations in colors. Price, $1.50. (*Philadelphia: P. Blakiston's Son & Co.*)

To quote from the preface: "The purpose of this little book is economy of time and labor for both the instructor and student . . . . an aid toward the accomplishment of a great amount of work . . . . an aid, further, toward an improvement in the quality of that work."

An extended review of the guide book thus offered does not seem worth while. The subject as a whole is taken up in the customary order. The tissues and organs are introduced by an examination of their gross characters and relations. This is followed by study with the dissecting lens, and finally sections and special methods are used. Tissues are selected from various regions of the body, and embryological conditions are constantly referred to.

The topics and sequence are much the same in all of our elementary text-books of histology; but we have here presented a precise method of approach, a prescribed system in which each step is to be made under the author's specific guidance and questions. The system is elaborated with much patience and industry. The questions and suggestions directing attention to all phases of the subject are often very good, though it would demand very special knowledge, if not considerable research, to answer some. No detail seems neglected, even the most apparent structures and relations being pointed out tirelessly. It might be an improvement to omit much that is mere identification or enumeration.

The book is thus seen to be strictly a guide, not an exposition. The technical procedures recommended for the preparation and examination of specimens will be found generally excellent. The pages on histological drawing are novel, and contain much information for the beginner not readily found elsewhere. The section on the Central Nervous System is perhaps the best, though presented in great detail, and demanding a maximum of time and work for this class of students. Much of this might well be classed as advanced study. The references to literature should include more of the great works and less of the relatively trivial.

Such a guide, accompanied by a text-book with figures, may be useful to students who are forced to work alone, but it is not clear that the economy of time and labor claimed will result, for the directions appear to demand an exceptional allotment of attention. While the subject is well systematized, we should advocate more freedom. More emphasis on the fundamentally important relations with less insistence upon the evident, little understood or relatively subordinate.

It seems probable that the improvement in quality of work aimed at by the author would be more surely secured by cutting out much of the required work, and encouraging the student to apply time so gained to approaching special aspects of the subject, under general supervision, in a more self-reliant spirit, using special material or methods.

Diseases of the Nose, Throat and Ear. By FRANCIS R. PACKARD, M. D. (*Philadelphia: J. B. Lippincott Company, 1909.*)

Dr. Packard has not aimed to produce an elaborate text-book on the nose, throat and ear, but rather to offer to readers a book in which is set forth his own views regarding the care of patients suffering with diseases of these parts. He has devoted a considerable amount of space to a discussion of the treatment of certain conditions which are seen more frequently by the general practitioner than by the specialist, *i. e.*, to tonsillitis, laryngitis,

coryza and hay-fever, which makes the book of considerable value to the family physician. For the general practitioner or the specialist, who desires to know the view-point of a fellow worker of considerable clinical experience in these special branches of medicine, this book will be found to contain helpful suggestions for the conservative treatment of the commoner troubles of these organs.

We congratulate the author on the pleasing way he presents his subject matter to the reader. The reviewer believes that the operations of tracheotomy and intubation should have been included in this book, and space should have been alloted to a full discussion of diphtheria with its nasal and laryngeal complications and the treatment of the same.

American Practice of Surgery. Editors: JOSEPH D. BRYANT, M. D., LL. D., and ALBERT H. BUCK, M. D. Vol. V. (*New York: William Wood & Co., 1908.*)

The comprehensiveness of this work can be estimated from the fact that the entire volume of over 900 pages is devoted to the surgery of the head, pharynx and larynx. Eleven authors have contributed each a chapter. The longest of these, consuming more than a third of the volume, on Surgical Affections and Wounds of the Head, is by Archibald, of Montreal. It is exhaustive, but not easy reading, as the author's style lacks simplicity; he devotes many pages to the physiology of certain cerebral lesions (concussion, shock, etc.), and it seems doubtful whether such considerations are discussed to advantage in a work on practical surgery. With less time than it would take to read these 300 and more pages on the surgery of the head, better and briefer articles on the subject can be found in English. The succeeding chapters are on the cranial nerves, face, hare-lip and cleft palate, eye, ear, sinus thrombosis and labyrinth, pyogenic diseases of the brain of otitic origin, pharynx, larynx and trachea, and laryngectomy. These are respectively written by Frazier, Harlan, Hartley, Knight, Lewis, De Nancrède, Newcomb, Reik, Richards and Stone, known for their special work along these various lines. Just why the surgery of the head should have been so divided up is not clear, and can hardly be said to add to the value of the work, for it makes it unnecessarily long by necessary repetition. To those who enjoy these ponderous systems, this one will prove highly attractive, abundantly illustrated as it is, and with almost all the information necessary for a young surgeon who has had little or no hospital practice. It is representative of American surgery only in so far as it is written by American surgeons, for much of the surgery described has been first put into practice by foreigners. This is well, for it would be unfortunate were there any really opposing schools of surgery. Each country can both give and receive with profit to itself in surgery as well as in law or business, and it is a pity a book should bear a name which is more or less falsely designative. However, what's in a name? It is what is in the book that counts, and the readers must, like the critic, decide this for themselves.

Surgery: Its Principles and Practice. In five volumes. By 66 eminent surgeons. Edited by W. W. KEEN, M. D., LL. D., etc. Volume IV. 1194 pages, 562 text-illustrations and 9 colored plates. Price, $7. (*Philadelphia and London: W. B. Saunders Company, 1908.*)

In this volume is described the surgery of hernia, of the intestines, rectum, genito-urinary organs, eye and ear, as well as military, naval and tropical surgery—a strangely assorted combination of subjects. To the penis and urethra 115 pages are devoted. more than to any other chapter, showing a somewhat uneven disproportion of space, in relation to the importance of the topics treated. The text is well edited, and the papers are written by men who are experts in the subjects they treat. There is a clear and excellent paper by Cabot on Stone in the Bladder, and Young writes with equal authority on the Prostate. No one more competent than De Schweinitz could have been secured to write on the Surgery of the Eye, or Coley on Hernia, or Edsall on Examination of the Urine in Relation to Surgical Measures. O'Reilly's and Rixey's respective contributions to Military and Naval Surgery are timely and valuable. It is not necessary to mention by name the rest of the contributors whose names are all well known to the profession. It is certain that this new Surgery will long retain a prominent position and that it will prove a most serviceable work to the profession. The book is well and not over illustrated, and the publishers may well be content with its appearance. In spite of its many excellencies, the work has some deficiencies. It is desirable that more attention should be paid by the editors to the preparation of the bibliography which accompanies the articles. Only the word "slovenly" describes this work as it appears in this volume. Misprints are numerous, there is no uniform abbreviation of titles, dates are omitted, capitalization is frequently wrong, accents of French words are omitted, in the German titles *Bd.* and Vol. are both used indiscriminately, and *S* (for page) is sometimes used and as often omitted. To note such carelessness may seem hypercritical, but in a standard work of this nature all parts should receive their due attention.

Report on the Prevention of Malaria in Mauritius. By RONALD ROSS, F. R. C. S., etc. (*London: Waterlow & Sons, 1908.*)

The work of Ross is universally recognized to be of such a high order that this new report by him requires no commendation. It is a most thorough-going and painstaking study; almost too scientific for the majority of readers who have no knowledge of higher mathematics. The author has used this science to get at as nearly accurate figures as to the prevalence of malaria in the island as possible, and there is no other study of endemic malaria which furnishes such elaborate statistics. Part I deals with Malaria in General; Part II with Malaria in Mauritius; Part III with the Prevention of Malaria in Mauritius; and there are numerous Addenda. The report has many tables, charts and photographs to make it complete. As an addition to the already large literature on malaria, this study takes first rank.

Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India. Issued Under the Authority of the Government of India by the Sanitary Commissioner with the Government of India-Simla. (*Calcutta: Superintendent Government Printing, India, 1908.*)

New Series, No. 32. An Enquiry on Enteric Fever in India, Carried out at the Central Research Institute, Kasauli, Under the Direction of LIEUTENANT-COLONEL D. SEMPLE, M. D., Director of the Institute, and CAPTAIN E. D. W. GREIG, M. D. Price, 1*s.* 2*d.*

No. 33. The Production of Alkali in Liquid Media by the *Bacillus Pestis.* By LIEUTENANT-COLONEL W. B. BANNERMAN, M. D., etc. Price, 6d.

No. 34. Standards of the Constituents of the Urine and Blood and the Bearing of the Metabolism of Bengalis on the Problems of Nutrition. By CAPTAIN D. MCCAY, M. B., etc. Price, 1*s.* 2*d.*

The Government of India may well be satisfied by the work of its medical officers. It is spending much money on its scientific institutes, and this series of reports is a valuable one. The "Enquiry on Enteric Fever" is perhaps the most important of the three reports which have just been received, as it deals with the problem of the chronic bacillus carrier, a problem which confronts the entire medical profession where typhoid exists, or in other words, the entire civilized world. It is to-day the question of greatest interest concerning this disease, as until it

is possible to eliminate this factor in the propagation of typhoid fever, there is no possibility of controlling it within limits. The typhoid bacillus carrier is almost as great a danger to the community as the consumptive who is not under control. Doctors Semple and Greig, from their most careful investigations deduce the following conclusions, which, while not new, add none the less weight in impressing on the mind of the profession the importance of extreme care in the nursing of typhoid fever patients.

1. *Enteric Convalescents.*—Our investigations have shown that a certain percentage of enteric cases remain infective for a long time. In order to detect such cases the urine and fæces of all convalescents should be submitted to a careful daily bacteriological examination for a prolonged period. By this means it will be possible to state when men are free from bacilli and safe to return to their units.

2. *Enteric Orderlies.*—As has been shown in this report, a number of men, whilst in attendance on enteric fever cases, contract the disease and some of them so slightly that they do not report sick. A certain number of these orderlies become "chronic bacilli carriers," and under the present system, at the end of the period of duty as enteric nursing orderlies, these men return to their units and so take fresh foci of infection to their various stations. By creating a special permanent body of trained men to nurse enteric patients a considerable danger, as regards the spread of enteric fever, would be removed.

3. *Men Dealing with Food Supplies, e. g., in Cookhouses, Dairies, Aerated Water and Ice Factories, etc.*—As we have seen, epidemics of enteric fever can be caused by men dealing with food supply while they are excreting the germ of the disease. The elimination of this danger can be accomplished only by a careful bacteriological examination of all men (European and native) before permitting them to be employed in connection with the preparation and distribution of articles of food and drink.

It will be seen from the above that the problem of the prevention of enteric fever amongst the British troops in India is the detection and isolation of the individual harboring the bacillus typhosus.

The other two reports are of minor importance, but those interested in the questions of metabolism will find Dr. McCay's paper well worth reading. It is impossible to summarize his conclusions, which cover many points, in this brief notice. Dr. Bannerman's study is so purely technical, that only those who have had a chance to study the bacillus will be able to judge of its value.

Experimental Researches on Specific Therapeutics. By Prof. Paul Ehrlich, M. D., D. Sc. Oxon., etc. Price, $1. (*New York:* Paul B. Hoeber, *1909.*)

Under this title the Harben Lectures for 1907 of the Royal Institute of Public Health have been reprinted in a small but neat form. As all investigators in immunity know, all that is written by Ehrlich must be read and carefully studied. He is the leading authority of the world in all questions dealing with the blood, and this reprint of his lectures will be welcomed. They are not easy reading, and require a real knowledge of the subject treated, but they cannot be disregarded by any student who desires to master the intricate problems, that have been developed through the researches of Ehrlich and his followers.

Traité Pratique de Therapeutique Infantile Medico-Chirurgicale. By Paul Le Gendre, M. D., et Aug. Broca, M. D. Second edition. (*Paris: G. Steinheil, 1908.*)

The second edition of this valuable treatise on Therapeutics in Infancy, both medical and surgical, has recently come to hand.

The work commences with a general review of infant feeding, natural and artificial. The importance of the examination of mother's milk and the various means of altering the proportion of ingredients in a faulty milk are detailed at length, as well as the hygienic surroundings in which a nursing mother should live. The importance of determining the calorific value of milk, either natural or artificial, is not sufficiently dwelt upon by the authors, and the value of vegetable bouillon is perhaps unduly emphasized; at least, its advantage over cereal waters has not been specially realized in this country.

A valuable chapter follows on the various external therapeutic remedies adapted to the treatment of children, and the means of administering medicines and their dosages are also fully described in a subsequent chapter.

In the second part of the book, diseases, medical and surgical, to which children are liable, are taken up in alphabetical order and in the main are satisfactorily treated. This method rather precludes the thorough and systematic consideration of the various systems and renders the description of the diseases somewhat unsatisfactory. It has, however, the advantage of a ready reference to all the more common ailments, and this is probably what the authors are particularly anxious to provide.

An extensive formulary is appended, which, however, would be much more serviceable to a French student than one in this country.

The book serves a very useful purpose and should find a place in the library of every one having much to do with the treatment of children. J. H. M. K., Jr.

Neurological and Mental Diagnosis. A Manual of Methods. By L. Pierce Clark, M. D., and A. Ross Diefendorf, M. D. Price, $1.25. (*New York: The Macmillan Company, 1908.*)

This is a book of 188 pages, including the index, the first 60 pages of which have been written by Dr. Clark, and which give, in a concise form, the procedure for a complete examination of a patient supposed to be suffering from a nervous disorder. The description is simple and clear, with the exception of one or two instances; for instance, at the bottom of page 7 we find this sentence in describing the examination of the IIId, IVth and VIth cranial nerves:

"The head must be held steady (candle test with red glass in front of one eye)," and we naturally expect a description of this test to follow immediately, but it does not occur until page 10, where it is clearly given.

The second part is written by Dr. Diefendorf, who gives the procedure for the detection of mental disorders, this also being written in an admirable way. In order to make the matter clearer, the seven "common forms of insanity encountered most often by the practitioner" are illustrated by case abstracts in which a full description of the mental examination serves to illustrate the points to which attention was directed in the description of procedure. Finally, there is a glossary of terms used in psychiatry which will be convenient to those entering upon this subject. About the only point on which we differ from the author is the order in which he elicits symptoms, in our opinion it being better to leave the subjects of hallucinations and illusions to the latter part of the examination, when the patient's confidence has been gained, rather than to seek for them in the beginning.

The work is intended as an aid to "the student and general practitioner to make thorough and systematic examinations in nervous and mental diseases," and will undoubtedly be popular, as it is so well and clearly written that it will naturally appeal to beginners in these two somewhat difficult, but important, branches of medicine.

The book is well illustrated by numerous original half-tones, and its appearance is quite up to the standard of the publishers.

W. R. D.

BOOKS RECEIVED.

Green's Encyclopedia and Dictionary of Medicine and Surgery. Edited by J. W. Ballantyne, M. D., F. R. C. P. E. Vol. X. Thiersch-Zymotic. [1909.] 4to. 609 pages. W. T. Keener & Co., Chicago.

A System of Diet and Dietetics. Edited by G. A. Sutherland, M. D., F. R. C. P. 1908. 8vo. 893 pages. Oxford Medical Publications. Henry Frowde, London; Hodder & Stoughton, London.

Rotunda Practical Midwifery. By E. Hastings Tweedy, M. D., F. R. C. P. I., and G. T. Wrench, M. D. 1908. 8vo. 464 pages. Oxford Medical Publications. Henry Frowde, London; Hodder & Stoughton, London.

Practical Physiological Chemistry. By Philip B. Hawk. Second edition, revised and enlarged, with two full-page plates of absorption spectra in colors, four additional full-page color plates and one hundred and twenty-six figures, of which twelve are in colors. 1909. 8vo. 447 pages. P. Blakiston's Son & Co., Philadelphia.

Appendicitis and Other Diseases of the Vermiform Appendix. By Howard A. Kelly, M. D. With 215 original illustrations, some in colors, and 3 lithographic plates. [1909.] 8vo. 502 pages. J. B. Lippincott Company, Philadelphia and London.

The Herter Lectures (New York, 1908). The Fluids of the Body. By Ernest H. Starling, M. D., F. R. C. P., F. R. S. 1909. 8vo. 186 pages. W. T. Keener & Company, Chicago.

New and Non-official Remedies, 1909. Containing Descriptions of the Articles which have been Accepted by the Council on Pharmacy and Chemistry of the American Medical Association Prior to Jan. 1, 1909. 12mo. 167 pages. American Medical Association, Chicago.

Tuberculosis of the Nose and Throat. By Lorenzo B. Lockard, M. D. With eighty-five illustrations, sixty-four of them in colors. 1909. 8vo. 384 pages. C. V. Mosby Medical Book & Publishing Company, St. Louis.

Manual of Diseases of the Ear. Including those of the Nose and Throat in Relation to the Ear. By Thomas Barr, M. D., and J. Stoddart Barr, M. B., Ch. B. Fourth edition, entirely revised and largely re-written. 1909. 8vo. 477 pages. James Maclehose & Sons, Glasgow.

Hand-book for Attendants on the Insane. Fifth edition, revised and enlarged. Published by the authority of the Medico-Psychological Association. 1909. 12mo. 390 pages. W. T. Keener & Co., Chicago.

Epoch-making Contributions to Medicine, Surgery and the Allied Sciences. Being Reprints of those Communications which First Conveyed Epoch-making Observations to the Scientific World, together with Biographical Sketches of the Observers. Collected by C. N. B. Camac, A. B., M. D. With portraits. 1909. 8vo. 435 pages. W. B. Saunders Company, Philadelphia and London.

Hemorrhage and Transfusion. An Experimental and Clinical Research. By George W. Crile, A. M., M. D. 1909. 8vo. 560 pages. D. Appleton & Company, New York and London.

Parcimony in Nutrition. By Sir James Crichton-Browne, M. D., LL. D., F. R. S. 1909. 12mo. 111 pages. Funk & Wagnalls Company, London and New York.

A Text-Book of Materia Medica, Pharmacology and Therapeutics. By George F. Butler, A. M., Ph. G., M. D. Sixth edition, thoroughly revised and enlarged. 1908. 8vo. 708 pages. W. B. Saunders Company, Philadelphia and London.

Progressive Medicine. A Quarterly Digest of Advances, Discoveries and Improvements in the Medical and Surgical Sciences. Edited by Hobart Amory Hare, M. D., assisted by H. R. M. Landis. Volume I. March, 1909. 8vo. 277 pages. Lea & Febiger, Philadelphia and New York.

Manual of Operative Surgery. By H. J. Waring, M. S., M. B., B. Sc. (Lond.), F. R. C. S. (Eng.). Third edition. Illustrated with 521 figures, several of which are in colors. 1909. 750 pages. Oxford Medical Publications. Henry Frowde, London; Hodder & Stoughton, London.

International Clinics. A Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles. Edited by W. T. Longcope, M. D. Nineteenth series. Volume I. 1909. 8vo. 307 pages. J. B. Lippincott Company, Philadelphia and London.

A System of Operative Surgery. By Various Authors. Edited by F. F. Burghard, M. S. (Lond.), F. R. C. S. (Eng.). In four volumes. Volume I. The Principles and Technique of Wound Treatment, the Methods of Local Analgesia, Amputations, etc. 1909. 8vo. 751 pages. Oxford Medical Publications. Henry Frowde, London; Hodder & Stoughton, London.

Text-Book of Medical Chemistry and Toxicology. By James W. Holland, A. M., M. D. Fully illustrated. Second edition, revised and enlarged. 1908. 8vo. 655 pages. W. B. Saunders Company, Philadelphia and London.

Saint Bartholomew's Hospital Reports. Edited by H. Morley Fletcher, M. D., and W. McAdam Eccles, M. S., F. R. C. S. Vol. XLIV. 1908. 8vo. 190 + 287 pages. 1909. Smith, Elder & Co., London.

Papers by J. H. Bryant, M. D., F. R. C. S. Collected Reprints from 1893-1905. London.

Transactions of the College of Physicians of Philadelphia. Third series. Volume the thirtieth. 1908. 8vo. 256 pages. Printed for the College, Philadelphia.

INDEX TO VOLUMES 1-16 OF BULLETIN.

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